



November 2008

**Section 27
Environmental Protection Act
R.S.O. 1990**

**Sample Application Package
for an Amendment to a Provisional Certificate
of Approval for a Waste Disposal Site**

Landfill Gas Collection and Control System

PIBS 6836e

Protecting our environment.



FOREWORD

This document has been produced by the Environmental Assessment and Approvals Branch as an example of a complete application submission for a Certificate of Approval for a waste disposal site. While every effort has been made to ensure the accuracy of the information contained in this document, it should not be construed as legal advice.

The following forms have been used in this sample application package:

- [Application for a Provisional Certificate of Approval for a Waste Disposal Site](#)
- [Costs for EPA s.27 Applications, Supplement to Application for Approval](#)

Instructions for completing these forms and additional information about Waste Disposal Site Certificates of Approval is available in the following publications:

- [Green Facts: Certificates of Approval – Waste Disposal and Management](#)
- [Guide to Applying for Approval of Waste Disposal Sites](#)
- [Guide – Application Costs for Waste Management, EPA s.27](#)
- [Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfilling Sites \(May 1998\)](#)
- [Landfill Gas Capture: A Guideline on the Regulatory and Approval Requirements for Landfill Gas Capture Facilities](#)

For more information about Certificates of Approval or to obtain an application package, please visit the Ministry of the Environment Internet site at <http://www.ene.gov.on.ca> or contact:

Ministry of the Environment
Environmental Assessment and Approvals Branch
2 St. Clair Ave W, Floor 12A
Toronto, ON M4V 1L5

Toll Free: 1-800-461-6290
Phone: 416-314-8001
Fax: 416-314-8452
Email: EAABGen@ene.gov.on.ca

**APPLICATION FOR AMENDMENT TO PROVISIONAL CERTIFICATE
OF APPROVAL FOR A WASTE DISPOSAL SITE**

**Acme Landfill Site
Anytown, Ontario**

JULY 2008

**Prepared by:
P.E.S. Waste Management**

Project Number 053400-10



Virginia Trust-Worthy
General Manager
Acme Inc.
123 Anywhere Street
Anytown, Ontario
N9N 1A1

Project 053400-10
July 31, 2008

Environmental Assessment and Approvals Branch
2 St. Clair Avenue West
Floor 12A
Toronto, ON M4V 1L5

Dear Sir or Madam:

Re: Application for an Amendment to
Provisional Certificate of Approval for a Waste Disposal Site
ACME Inc. Landfill Site, Anytown, Ontario

The enclosed is three copies of an Application for an Amendment to Provisional Certificate of Approval for a Waste Disposal Site and supporting documentation for the ACME Inc. Landfill Site, located in Anytown, Ontario.

The application contains the following:

- Application for Amendment Approval (Waste Disposal Site);
- Attachment 1 – Supporting Information Checklist;
- Attachment 2 - Costs for EPA s.27 Applications, Supplement to Application for Approval; and
- Attachment 3 – Design and Operations Report for Landfill Gas Collection and Control System.

A copy of the Application and supporting documentation has also been sent to the Ministry of the Environment (MOE), Anytown District Office.

Sincerely,

Virginia Trust-Worthy

Virginia Trust-Worthy
Site Manager

BB/ja/2
Encl.
c.c.: District Manager, MOE (Anytown District Office)

Application For Amendment Approval (Waste Disposal Site)

For Office Use Only			
Reference Number	Payment	Date (y/m/d)	Initials
	\$		

General Information and Instructions

General:

Information requested in this form is collected under the authority of the *Environmental Protection Act*, R.S.O. 1990 (EPA) and the *Environmental Bill of Rights*, C. 28, Statutes of Ontario, 1993, (EBR) and will be used to evaluate applications for approval of waste disposal sites under Section 27, EPA.

Instructions:

- Applicants are responsible for ensuring that they complete the most recent application form.** When completing this form, please refer to the following guidance material: the "Guide for Applying for Certificate of Approval of Waste Disposal Sites, Section 27, 30, 31 and 32, EPA," (referred to as the Guide) and "Guide - Application Cost for Waste Management, S. 27, EPA." Application forms and supporting documentation are available from the Environmental Assessment and Approvals Branch toll free at 1-800-461-6290 (locally at 416-314-8001), from your local District Office of the Ministry of the Environment, and in the "Publications" section of the Ministry of the Environment website at <http://www.ene.gov.on.ca/envision/gp/index.htm#disposal>
- Questions regarding completion and submission of this application should be directed to the Environmental Assessment and Approvals Branch, 2 St. Clair Avenue West, Floor 12A, Toronto, Ontario, M4V 1L5, telephone number 1-800-461-6290 or (416) 314-8001, or to your local District Office of the Ministry of the Environment.
- A complete application consists of:
 - a completed and signed application form;
 - all required supporting information identified in this form, the guidance material, and
 - a certified cheque, money order or credit card payment, in Canadian funds, made payable to the *Ontario Minister of Finance* for the applicable application fee.

This form must be completed with respect to all requirements identified in the guidance material in order for it to be considered an application for approval.
INCOMPLETE APPLICATIONS WILL BE RETURNED TO THE APPLICANT. The Ministry may require additional information during the technical review of any application accepted as complete.
- The original application, along with the supporting information and the application fee, must be sent to:
**The Ministry of the Environment,
Director, Environmental Assessment and Approvals Branch,
2 St. Clair Avenue West, Floor 12A, Toronto, Ontario, M4V 1L5**
A copy of the application and the supporting information must be sent to the local Ministry District Office which has jurisdiction over the area where the facilities are located.
- Information contained in this application is not considered confidential and will be made available to the public upon request. Information submitted as supporting information may be claimed as confidential but will be subject to the *Freedom of Information and Protection of Privacy Act* (FOIPPA) and *EBR*. If you do not claim confidentiality at the time of submitting the information, the Ministry may make the information available to the public without further notice to you.
- If the applicant submits with the application a copy of their Master Business Licence (MBL) obtained from the Ministry of Government Services, the shaded sections within this form do not need to be completed (provided the information required appears on the face of the MBL). For additional information on the MBL please refer to the guidance material.

1. Applicant Information (Owner of works/facility)

Applicant Name (legal name of individual or organization as evidenced by legal documents) Acme Inc.		Business Identification Number 123456789
Business Name (the name under which the entity is operating or trading if different from the Applicant Name - also referred to as trade name)		
Applicant Type: <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Federal Government <input type="checkbox"/> Individual <input type="checkbox"/> Municipal Government <input type="checkbox"/> Partnership <input type="checkbox"/> Provincial Government <input type="checkbox"/> Sole Proprietor <input type="checkbox"/> Other (describe): _____		Activity Classification Code/Standard Industrial Classification Code (if unknown please complete Business Activity Description) 562212
Business Activity Description (a narrative description of the business endeavour, this may include products sold, services provided or machinery/equipment used, etc.)		

2. Applicant Physical Address - Complete A, C and D or B, C and D

A. Civic Address- Street information (applies to an address that has civic numbering and street information includes street number, name, type and direction) 123 Anywhere Street		Unit Identifier (identifies type of unit, such as suite & number)
B. Survey Address (used for a rural location specified for a subdivided township, an unsubdivided township or unsurveyed territory)		
Lot and Conc.: used to indicate location within a subdivided township and consists of a lot number and a concession number Lot: _____ Conc.: _____	Part and Reference: used to indicate location within an unsubdivided township or unsurveyed territory, and consists of a part and a reference plan number indicating the location within that plan. Attach copy of the plan Part: _____ Reference Plan: _____	
C. Municipality/Unorganized Township Anytown	County/District Prosperous County	Province/State Ontario
Country Canada	Postal Code N9N 1A1	
D. Telephone Number (including area code & extension) (905) 555-1985	Fax Number (including area code) (905) 555-1967	E-mail Address vtrust@acmeinc.com

A. Civic Address - Street information <i>(includes street number, name, type and direction)</i>					<input checked="" type="checkbox"/> Same as Applicant Physical Address	Unit Identifier <i>(identifies type of unit, such as suite & number)</i>
B. Delivery Designator:					<input type="checkbox"/> Rural Route <input type="checkbox"/> Suburban Service <input type="checkbox"/> Mobile Route <input type="checkbox"/> General Delivery	Delivery Identifier <i>(a number identifying a Rural Route, Suburban Service or Mobile Route delivery mode)</i>
C. Municipality	Postal Station	Province/State	Country	Postal Code		

Site Name Acme Landfill Site		MOE District Office Anytown District Office		Legal Description(attach copy of a legal survey)							
Site Address - Street information (<i>applies to an address that has civic numbering and street information – includes street number, name, type and direction</i>) _____				<input checked="" type="checkbox"/> Same as Applicant Physical Address			Unit Identifier (<i>identifies type of unit, such as suite & number</i>) _____ 				
Survey Address (<i>used for a rural location specified for a subdivided township, an unsubdivided township or unsurveyed territory</i>) _____											
Lot and Conc.: used to indicate location within a subdivided township and consists of a lot number and a concession number Lot _____ Conc. _____			Part and Reference: used to indicate location within an unsubdivided township or unsurveyed territory, and consists of a part and a reference plan number indicating the location within that plan. Attach copy of the plan Part _____ Reference Plan _____								
Non Address Information (<i>includes any additional information to clarify applicants' physical location</i>) _____ 											
Geo Reference											
Map Datum		Zone		Accuracy Estimate		Geo Referencing Method		UTM Easting		UTM Northing	
Municipality/Unorganized Township			County/District				Postal Code				
Adjacent Land Use <input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Recreational <input type="checkbox"/> Other(<i>specify</i>): _____											
Is the Site located in an area of development control as defined by the Niagara Escarpment Planning & Development Act (NEPDA)? <input type="checkbox"/> Yes (If yes, attach copy of NEPDA permit for proposed activity/work) <input checked="" type="checkbox"/> No											
Is the Site located on the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan (ORMCP), a regulation made under the Oak Ridges Moraine Conservation Act (ORMCA)? <input type="checkbox"/> Yes (if yes, please attach proof of Municipal planning approval for the proposed activity/work) <input checked="" type="checkbox"/> No											
Is the Applicant the operating authority? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No, attach the operating authority name, address and phone number _____						Is the Applicant the owner of the land (site)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No, attach the owner's name, address and consent for the installation and operation of the facilities _____					

A. Name Joe Consultant		Company P.E.S. Waste Management		<input type="checkbox"/> Same as Applicant Name
B. Civic Address - Street information (includes street number, name, type and direction) 234 Other Street		<input type="checkbox"/> Same as Applicant Physical Address		Unit Identifier (identifies type of unit, such as suite & number) Suite 1
C. Delivery Designator:		<input type="checkbox"/> Rural Route <input type="checkbox"/> Suburban Service <input type="checkbox"/> Mobile Route <input type="checkbox"/> General Delivery		Delivery Identifier (a number identifying a Rural Route, Suburban Service or Mobile Route delivery mode)
D. Municipality Anytown	Postal Station	Province/State Ontario	Country Canada	Postal Code N9K 2B2
E. Telephone Number (including area code & extension) (905) 555-2345		Fax Number (including area code) (905) 555-2399		E-mail Address joeconsultant@pes.com

6. Project Information

Type of Application: <input type="checkbox"/> New Certificate of Approval <input checked="" type="checkbox"/> Amendment to current Certificate of Approval		Current Certificate of Approval Number 5555-5A5AA5	Date of Issue (y/m/d) 1990/01/01
Project Description Summary (If EBR is applicable, this summary will be used in the EBR posting notice)			
This application is for the installation of landfill gas collection and control system with flaring at a solid waste management facility.			
Project Name (Project identifier to be used as a reference in correspondence) Acme Landfill Site (Landfill Gas Project)			
Estimated date for start of construction/installation (yyyy/mm/dd) 2009/08/01		Project Schedule Estimated date for start of operation (yyyy/mm/dd) 2010/12/31	

7. Facility Description (information on the nature of business or activity at this site)

Present Land Use Landfill	Present Official Plan Designation Landfill	Present Zoning Category Open Space
Maximum daily amounts of waste which may be received at the site (attach a description of each, including their source)		
Waste Type	Tonnes	Cubic Metres
Liquid Industrial		
Non-hazardous Solid Domestic, Commercial, Institutional or Industrial		1,500
Hazardous		
Other		
Waste Class Names		Waste Class Codes
Days and Hours of Operation Monday-Friday: 8am-5pm		Population Served 100,000
Names of all municipalities to be served by this site Anytown		Total Area of Site (hectares) 49.4
Type of Facility/Operation (complete all appropriate sections): <input checked="" type="checkbox"/> Landfill <input type="checkbox"/> Transfer <input type="checkbox"/> Processing <input type="checkbox"/> Incinerator <input type="checkbox"/> Other (describe): _____		
Landfill Site Information		
Area to be Land filled (hectares) 23.5	Maximum estimated site land filling capacity (cubic metres) 3.9 million	Estimated Date of Closure (y/m/d) 2014/12/31
Control Types Landfill Gas and Leachate		Monitoring Landfill Gas, Ground Water and Surface Water
Transfer and/or Processing Site information		
Maximum Storage Capacity	tonnes	litres
		cubic metres
Maximum Residual Waste for Final Disposal	tonnes/day	litres/day
		cubic metres/day
List all disposal sites and site certificate numbers for final disposal		
Incinerator Site information		
Maximum Storage Capacity	tonnes	litres
		cubic metres
Maximum Feed Rate	List all disposal sites and site certificate numbers for final disposal of residue	
tonnes/day	cubic metres/day	

8. Other Approvals / Permits

List all other environmental approvals/permits applied for related to this project or received in relation to this project under the <i>Environmental Protection Act</i> (discharges to air, waste management, etc.) and the <i>Ontario Water Resources Act</i> (water and sewage works).
Certificate of Approval (Air and Noise)

9. Public Consultation/Notification

Specify all public consultation/notification (such as public hearings, notification of First Nations, etc.) related to the project that has been completed or is in the process of being completed.
A meeting with the Landfill Public Liaison Committee will be planned

10. Environmental Bill of Rights Requirements

Is this a proposal for a Prescribed Instrument under EBR? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If "Yes," is it excepted from public participation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If it is excepted from public participation provide reason: <input type="checkbox"/> Equivalent Public Participation <input type="checkbox"/> Environmentally Insignificant Amendment or Revocation <input type="checkbox"/> Emergency <input type="checkbox"/> EAA or Tribunal Decision	
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11. Environmental Assessment Act (EAA) Requirements

<input checked="" type="checkbox"/> The works are not subject to EAA for the reason specified below: Not subject to EA requirements under Reg. 101/07
<input type="checkbox"/> The works are proceeding in accordance with the Environmental Assessment Process Approval Notice specified below:

12. Supporting Information Checklist - This is a list of all supporting information to this application and is subject to the FOIPPA and EBR.

Supporting information	Attached		Reference	Can be disclosed	
General					
Proof of Legal Name of Applicant	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Copy of NEPDA Permit	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Copy of Municipal Planning Approval (ORMCA)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Name, Address and Phone Number of the Operating Authority	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Name, Address and consent of land/site owner for the installation/construction and operation of the works/facility	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Verification of EBR Public Participation Exception	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Proof of Public Consultation/Notification	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Technical					
Site Plan/Location Map	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Hydrogeolocial Assessment Report	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	On File	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Design and Operations Report	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Drainage Study	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Financial Assurance	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	N/A	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Other Attached Information	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No		<input type="checkbox"/> Yes	<input type="checkbox"/> No

13. Payment Information

Amount Enclosed: \$ 1,400 Please attach completed "Costs for EPA s.27 Applications – Supplement to Application for Approval" (PIBS 4186).		
Method of Payment <input type="checkbox"/> Certified Cheque <input type="checkbox"/> Money Order <input checked="" type="checkbox"/> VISA <input type="checkbox"/> MasterCard <input type="checkbox"/> American Express		
Credit Card Information (if paying by VISA, MasterCard or American Express)*		
Name on Card (please print) Virginia Trust-Worthy	Credit Card Number 0000 0000 0000 0000	Expiry Date (mm/yy) 12/09
Cardholder Signature <i>Virginia Trust-Worthy</i>	Date (y/m/d) 2008/07/31	

*NOTE: credit card accepted for payments UNDER \$10,000.00 only.

14. Statement of Applicant

I, the undersigned hereby declare that, to the best of my knowledge, the information contained herein and the information submitted in support of this application is complete and accurate in every way and that the Project Technical Information Contact identified in section 5 of this form is authorized to act on my behalf for the purpose of obtaining approval under Section 27 of the EPA for the waste disposal site identified herein.	
Name (please print) Virginia Trust-Worthy	Title General Manager
Signature <i>Virginia Trust-Worthy</i>	Date (y/m/d) 2008/07/31

Attachment 1

Supporting Information Checklist

**SUPPORTING INFORMATION CHECKLIST
SUPPLEMENT TO APPLICATION FOR PROVISIONAL CERTIFICATE OF
APPROVAL FOR A WASTE DISPOSAL FACILITY -
DESIGN AND OPERATIONS REPORT FOR LANDFILL GAS COLLECTION AND
CONTROL SYSTEM**

The Design and Operations Report for the landfill gas collection and control system (LGCCS) submitted as part of the Application for amendment to a Provisional Certificate of Approval for a Waste Disposal Site should incorporate the following elements:

- ☐ Estimate of landfill gas production for the site in accordance with the MOE Interim Guide to Estimate and Assess Landfill Air Impacts, October 1992, including peak estimated rate of landfill gas production and time of occurrence.

- ☐ Assessment of the potential for subsurface migration of landfill gas at the site and incorporation of any required control systems necessary for monitoring or controlling the migration into the design of the LGCCS including:
 - (i) provision of methane gas monitoring devices, with detection alarms, for any occupied building located on site and confined space entry protocols for other buildings or enclosed structures that are accessible by any person;
 - (ii) general description of the safety precautions to be taken for methane gas for any building or enclosed structure located on site which contains electrical equipment or any potential source of ignition; and
 - (iii) general description of the soil and groundwater conditions at the site as well as the type of cover materials used at the landfill.

- ☐ Plans, specifications and descriptions of the design of the LGCCS, including:
 - (i) spatial design of the collection system including collector orientation, (i.e., vertical wells or horizontal trenches), layout and spacing, depth(s) of placement within the landfill, depth of liner at vertical well locations and radius of capture zone;
 - (ii) design of the collection pipes including size, material, perforations, granular bedding/envelope, and provisions for stress relief and settlement;
 - (iii) design of header and transmission pipes including size, material, slope, valving, access chambers, condensate control, venting of access chamber, seepage protection, protection from freezing, bedding and provisions for stress relief and settlement; and
 - (iv) provisions for condensate drainage, storage and disposal.

**SUPPORTING INFORMATION CHECKLIST
SUPPLEMENT TO APPLICATION FOR PROVISIONAL CERTIFICATE OF
APPROVAL FOR A WASTE DISPOSAL FACILITY -
DESIGN AND OPERATIONS REPORT FOR LANDFILL GAS COLLECTION AND
CONTROL SYSTEM**

- ☐ Plans, specifications and descriptions of the design of the facilities for landfill gas burning, treatment or utilization, including:
- (i) a description of the landfill gas extraction equipment (i.e., blower) and the design of any moisture removal and gas treatment system;
 - (ii) the design, performance characteristics and operational controls for any flare system including:
 - the type and design of the flare device,
 - design combustion temperature and residence time,
 - the destruction efficiency of volatile organic compounds, and
 - operational control systems such as temperature and combustion air control, flame failure detection, automatic ignition system and flame arrester; and
 - (iii) a description of any utilization system for collected landfill gas.
- ☐ Plans, specifications and descriptions of the operation, monitoring and maintenance procedures for the LGCCS, including:
- (i) phasing/timing of system installation, start-up and operation, particularly with respect to integration with overall landfill operation and maximizing landfill gas control;
 - (ii) inspection frequencies and maintenance/replacement procedures for system equipment;
 - (iii) monitoring of landfill gas flow rates and concentrations; and
 - (iv) contingency provisions in the event of unexpected component failures.
- ☐ Plans/drawings for the proposed LGCCS design should include the following:
- (i) plan showing existing conditions;
 - (ii) plans showing layout and phasing of completed LGCCS;
 - (iii) plan and profile drawings for major landfill gas collection piping, (e.g., landfill gas collection header);
 - (iv) plan/cross-sections showing details of the LGCCS including collectors (e.g., vertical wells and horizontal collectors), condensate storage/drainage facilities, control valving, pipe trenching and bedding, and connection details;
 - (v) LGCCS process schematic;

**SUPPORTING INFORMATION CHECKLIST
SUPPLEMENT TO APPLICATION FOR PROVISIONAL CERTIFICATE OF
APPROVAL FOR A WASTE DISPOSAL FACILITY -
DESIGN AND OPERATIONS REPORT FOR LANDFILL GAS COLLECTION AND
CONTROL SYSTEM**

- (vi) plans indicating radius of capture for landfill gas collectors and direction of landfill gas flow; and
 - (vii) plans/drawings stamped by a professional engineer.
- ☐ Description of the odour, noise and dust control plan during installation of system.
- ☐ LGCCS pipe design calculations including:
- (i) pipe strength calculations under worst-case loading conditions including material type and thickness.

Attachment 2

Costs For EPA S.27 Applications, Supplement To Application For Approval

**COSTS FOR EPA s.27 APPLICATIONS
SUPPLEMENT TO APPLICATION FOR APPROVAL**

This form is to be completed for all applications under the **Environmental Protection Act**, s.27. Please submit this form with your completed application form. For instructions/assistance completing this form, please refer to publication number 4187 titled: "Guide: Application Costs for Waste Management, s.27 Environmental Protection Act". This form and associated publications are available on the Ministry of the Environment web site at www.ene.gov.on.ca or by contacting the Environmental Assessment and Approvals Branch at 1-800-461-6290.

Company Name: Acme Inc.	Application/Certificate of Approval Number (if known) 5555-5A5AA5
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Application Cost: Indicate the applicable aspect of the application and complete the corresponding section of this form.

<input type="checkbox"/> Administrative amendment of an existing approval (Section 1)	Total Cost \$ 1400
<input type="checkbox"/> Fee exempted amendment or revocation of an existing approval (Section 2)	
<input type="checkbox"/> Preliminary Review (Section 3)	
<input checked="" type="checkbox"/> Approval, amendment or revocation requiring technical review (Section 4)	

SECTION 1: Administrative Amendment of an Existing Approval

Description	Cost	(✓)
Administrative amendment (no technical review involved)	\$ 100	<input type="checkbox"/>
TOTAL COST:		\$

SECTION 2: Fee Exempted Amendment or Revocation of an Existing Approval

Description	Cost	(✓)
Administrative revocation (no technical review involved)	\$ 0	<input type="checkbox"/>
Any revocation requested as a result of requirements imposed by conditions of an existing approval	\$ 0	<input type="checkbox"/>
Any amendment requested as a result of requirements imposed by conditions of an existing approval	\$ 0	<input type="checkbox"/>
TOTAL COST:		\$

SECTION 3:**Preliminary Review**

Description	Cost	(✓)
Preliminary reviews for approvals (new site or system) or amendments to existing approvals. Complete Section 4, excluding the administrative processing cost, and the cost is 25% of the total.	\$	<input type="checkbox"/>
Preliminary reviews for revocations of existing approval. Complete Section 4, excluding the administrative processing cost, and the cost is 25% of the total.	\$	<input type="checkbox"/>
Preliminary reviews as a result of action that the applicant has been required to take by the Director pursuant to a condition contained in a certificate.	\$ 0	<input type="checkbox"/>
TOTAL COST:		\$

SECTION 4:**Approval, Amendment or Revocation Requiring Technical Review (please complete corresponding table)**

<input type="checkbox"/> Waste Processing (Table 1)	<input type="checkbox"/> Incineration (Table 3)	<input type="checkbox"/> Waste Systems (Table 5)
<input type="checkbox"/> Waste Transfer (Table 2)	<input checked="" type="checkbox"/> Landfill/Waste Sites (Table 4)	<input type="checkbox"/> PCB Waste Sites and Systems (Table 6)

TABLE 1: Waste Processing

Description	Application Type	New System Design Capacity or Capacity Increase	Requires Design Review	Cost	(✓)
Administrative processing	All	N/A	N/A	\$ 200	<input type="checkbox"/>
Hazardous waste or liquid industrial waste	Approval or Revocation	≤ 100 tonnes per day	N/A	\$ 1,500	<input type="checkbox"/>
		> 100 tonnes per day	N/A	\$ 6,000	<input type="checkbox"/>
	Amendment	≤ 100 tonnes per day	Yes	\$ 1,150	<input type="checkbox"/>
		> 100 tonnes per day	Yes	\$ 4,500	<input type="checkbox"/>
		N/A	No	\$ 100	<input type="checkbox"/>
Waste other than hazardous waste and liquid industrial waste	Approval or Revocation	≤ 100 tonnes per day	N/A	\$ 1,200	<input type="checkbox"/>
		> 100 tonnes per day	N/A	\$ 4,800	<input type="checkbox"/>
	Amendment	≤ 100 tonnes per day	Yes	\$ 900	<input type="checkbox"/>
		> 100 tonnes per day	Yes	\$ 3,600	<input type="checkbox"/>
		N/A	No	\$ 100	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	N/A	N/A	\$ 18,000	<input type="checkbox"/>
TOTAL COST:				\$	

TABLE 2: Waste Transfer

Description	Application Type	New System Design Capacity or Capacity Increase	Requires Design Review	Cost	(✓)
Administrative processing	All	N/A	N/A	\$ 200	<input type="checkbox"/>
Hazardous waste or liquid industrial waste	Approval or Revocation	≤ 100 tonnes per day	N/A	\$ 1,200	<input type="checkbox"/>
		> 100 tonnes per day	N/A	\$ 4,800	<input type="checkbox"/>
	Amendment	≤ 100 tonnes per day	Yes	\$ 900	<input type="checkbox"/>
		> 100 tonnes per day	Yes	\$ 3,600	<input type="checkbox"/>
		N/A	No	\$ 100	<input type="checkbox"/>
Waste other than hazardous waste and liquid industrial waste	Approval or Revocation	≤ 100 tonnes per day	N/A	\$ 900	<input type="checkbox"/>
		> 100 tonnes per day	N/A	\$ 3,600	<input type="checkbox"/>
	Amendment	≤ 100 tonnes per day	Yes	\$ 700	<input type="checkbox"/>
		> 100 tonnes per day	Yes	\$ 2,700	<input type="checkbox"/>
		N/A	No	\$ 100	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	N/A	N/A	\$ 18,000	<input type="checkbox"/>
TOTAL COST:				\$	

TABLE 3: Incineration

Description	Application Type	New System Design Capacity or Capacity Increase	Requires Design Review	Cost	(✓)
Administrative processing	All	N/A	N/A	\$ 200	<input type="checkbox"/>
Hazardous waste or liquid industrial waste	Approval or Revocation	N/A	N/A	\$ 42,000	<input type="checkbox"/>
		N/A	Yes	\$ 21,000	<input type="checkbox"/>
	Amendment	N/A	No	\$ 1200	<input type="checkbox"/>
Waste other than hazardous waste and liquid industrial waste	Approval or Revocation	≤ 100 tonnes per day	N/A	\$ 18,000	<input type="checkbox"/>
		> 100 tonnes per day	N/A	\$ 42,000	<input type="checkbox"/>
	Amendment	≤ 100 tonnes per day	Yes	\$ 9,000	<input type="checkbox"/>
		> 100 tonnes per day	Yes	\$ 18,000	<input type="checkbox"/>
		N/A	No	\$ 1,200	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	N/A	N/A	\$ 18,000	<input type="checkbox"/>
TOTAL COST:				\$	

TABLE 4: Landfill/Waste Sites

Description	Application Type	New System Design Capacity or Capacity Increase	Requires Design Review*	Cost	(✓)
Administrative processing (applies to all except sites for hauled sewage and sites for biosolids)	All	N/A	N/A	\$ 200	<input checked="" type="checkbox"/>
Hazardous waste or liquid industrial waste	Approval or Revocation	N/A	N/A	\$ 60,000	<input type="checkbox"/>
	Amendment	N/A	Yes	\$ 48,000	<input type="checkbox"/>
		N/A	No	\$ 1,200	<input type="checkbox"/>
Waste other than hazardous waste and liquid industrial waste, other than sites referred to in item 15 Schedule 4, Reg 363.	Approval or Revocation	≤ 40,000 m ³	N/A	\$ 6,000	<input type="checkbox"/>
		> 40,000 m ³	N/A	\$ 30,000	<input type="checkbox"/>
		≤ 3 million m ³	N/A	\$ 60,000	<input type="checkbox"/>
		> 3 million m ³	N/A	\$ 60,000	<input type="checkbox"/>
	Amendment	≤ 40,000 m ³	Yes	\$ 4,500	<input type="checkbox"/>
		> 40,000 m ³	Yes	\$ 22,500	<input type="checkbox"/>
		≤ 3 million m ³	Yes	\$ 45,000	<input type="checkbox"/>
		> 3 million m ³	Yes	\$ 45,000	<input type="checkbox"/>
Waste referred to in item 15 Schedule 4, Reg 363 (uncontaminated tree stumps, leaves, branches, concrete and rocks).	Approval or Revocation	≤ 40,000 m ³	N/A	\$ 1,500	<input type="checkbox"/>
	Amendment	≤ 40,000 m ³	Yes	\$ 1,100	<input type="checkbox"/>
		≤ 40,000 m ³	No	\$ 100	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	N/A	N/A	\$ 18,000	<input type="checkbox"/>
TOTAL COST:				\$ 1400	

*or hydrogeological assessment

TABLE 5: Waste Systems

Description	Application Type	Cost	(✓)
Administrative processing (applies to all except sites for hauled sewage and sites for biosolids)	All	\$ 200	<input type="checkbox"/>
Administrative Amendments related to a hauled sewage or biosolids waste management system	All	\$ 50	<input type="checkbox"/>
Hazardous waste and liquid industrial waste haulage systems.	Approval or Revocation	\$ 400	<input type="checkbox"/>
	Amendment	\$ 400	<input type="checkbox"/>
A site certificate for mobile facilities relating to hazardous waste or liquid industrial waste, other than mobile incineration facilities and mobile PCB sites.	Approval or Revocation	\$ 800	<input type="checkbox"/>
	Amendment	\$ 400	<input type="checkbox"/>
Hauled sewage and biosolids waste management systems and the initial sites.	Approval or Revocation	\$ 600	<input type="checkbox"/>
	Amendment	\$ 300	<input type="checkbox"/>
		Additional Site x \$ 100	<input type="checkbox"/>
Waste management systems, other than hazardous waste, liquid industrial waste, hauled sewage and biosolids waste management systems	Approval or Revocation	\$ 300	<input type="checkbox"/>
Mobile waste disposal sites for waste other than hazardous waste and liquid industrial waste, other than mobile incineration facilities.	Approval or Revocation	\$ 800	<input type="checkbox"/>
	Amendment	\$ 400	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	\$ 18,000	<input type="checkbox"/>
TOTAL COST:		\$	

TABLE 6: PCB Waste Sites and Systems

Description	Application Type	Requires Design Review	Cost	(✓)
Administrative processing	All	N/A	\$ 200	<input type="checkbox"/>
Class 1 mobile PCB destruction facility waste disposal sites.	Approval or Revocation	N/A	\$ 12,000	<input type="checkbox"/>
	Amendment	N/A	\$ 12,000	<input type="checkbox"/>
Class 1 mobile PCB destruction facility waste management systems.	Approval or Revocation	N/A	\$ 12,000	<input type="checkbox"/>
	Amendment	Yes	\$ 9,000	<input type="checkbox"/>
		No	\$ 200	<input type="checkbox"/>
Class 2 or 3 mobile PCB destruction facility waste disposal sites.	Approval or Revocation	N/A	\$ 200	<input type="checkbox"/>
	Amendment	N/A	\$ 200	<input type="checkbox"/>
Class 2 mobile PCB destruction facility waste management systems.	Approval or Revocation	N/A	\$ 3,600	<input type="checkbox"/>
	Amendment	Yes	\$ 3,600	<input type="checkbox"/>
		No	\$ 100	<input type="checkbox"/>
Hearing (if mandatory or necessary)	All	N/A	\$ 18,000	<input type="checkbox"/>
TOTAL COST:			\$	

Attachment 3

Design And Operations Report For Landfill Gas Collection And Control System

FINAL

**DESIGN AND OPERATIONS REPORT FOR
A LANDFILL GAS COLLECTION AND CONTROL SYSTEM
ACME LANDFILL**

**Acme Inc.
123 Anywhere Street
Anytown, ON**

JULY 2008

**Prepared by:
P.E.S. Waste Management Ltd.
Anytown, ON**

Project Number 053400-10

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EXECUTIVE SUMMARY

This Application for Amendment to Provisional Certificate of Approval for a Waste Disposal Site and corresponding Design and Operations Report for a Landfill Gas Collection and Control System (LGCCS) serves as the design plan (Plan) for the Acme Landfill located in Anytown, Ontario.

Acme Inc. (Acme) operates a municipal solid waste landfill site located at 123 Anywhere Street in Anytown, Ontario (Site). Acme is proposing to install a LGCCS that includes one (1) enclosed flare and associated blower. The proposed installation is in response to the Ontario Ministry of Environment's (MOE) amendment to Ontario Regulations (O. Reg.) 232/98 and 347. The amendment requires landfills with greater than 1.5 million cubic metres (m³) of waste disposal capacity by June 30, 2009, to implement a LGCCS.

This report has been prepared pursuant to Part V of the Environmental Protection Act (EPA) Section 27, in accordance with O. Reg. 232/98 and O. Reg. 347.

The primary objectives for landfill gas (LFG) management at the Site are to:

- comply with applicable regulations;
- provide long-term control of potential LFG emissions to the atmosphere at a level that is considered the maximum feasible;
- assist with migration control; and
- if feasible, provide opportunity for generation of revenue through LFG utilization.

This Plan presents the design of the full LGCCS which includes the following:

- the collection well field including vertical extraction wells, horizontal collection trenches, and associated well field piping;
- LFG management facility including blower, enclosed flare, and associated controls; and
- condensate handling facilities for removal of excess moisture from the system.

Also included as part of this Plan, are descriptions of the intended operation of the LGCCS, monitoring, and contingency plans for effective operation of the system in accordance with the primary objectives.

1.0 INTRODUCTION

This document serves as the landfill gas collection and control system (LGCCS) design plan (Plan) for the Acme Landfill located in Anytown, Ontario (Site). This Plan has been prepared pursuant to Part V of the Environmental Protection Act (EPA) Section 27, in accordance with Ontario Regulations (O. Reg.) 347 and 232/98. A site location plan is provided on Figure 1.1 - Site Location Plan.

The existing landfill holds approximately 2.3 million cubic metres (m³) of waste with a total permitted capacity of 3.9 million m³ of waste. As summarized in Environmental Rights Environmental Registry (EBR) Proposal No. 010-3086 dated April 29, 2008 and decision June 26, 2008, the Ontario Ministry of the Environment (MOE) has amended both O. Reg. 347 and O. Reg. 232/98 with respect to the collection and control of landfill gas (LFG), under which operation of the Site is regulated. Amendment to O. Reg. 347 under subsection 1(1) requires that all landfills in Ontario meeting the following criteria submit to the MOE a report detailing the design, operation, maintenance, and monitoring of facilities for the collection and the burning or use of LFG generated by the site during operation of the site and during site closure if:

- the site accepts only municipal solid waste (MSW);
- on or after June 30, 2009, the site will landfill waste under a Certificate of Approval (C of A) or provisional C of A issued under Part V of the EPA;
- on or after June 30, 2009, the site will have a total waste disposal volume of more than 1.5 million m³; and
- a written report had not been required to be prepared with respect to the site under subsection 15(1) of O. Reg. 232/98 made under the EPA.

As an operating landfill meeting the above criteria, the Site is required to submit a report as detailed above and implement the described LFG control facilities.

This Plan details the design of the LGCCS to be installed, including how it relates to the proposed fill progression of the Site. The drawings attached to this Plan detail the design and layout of the proposed LGCCS.

A separate application for a C of A (Air) under Section 9 of the EPA including Acoustic Assessment has been submitted to the MOE for approval for the proposed LGCCS.

1.1 Compliance Summary Table

A summary of compliance with the amended regulations at the Site is presented in Table 1.1 - Regulatory Compliance, including cross-referencing to sections in this Plan.

1.2 Certification

P.E.S. Waste Management Ltd. (PES), as authorized by Acme Inc. (Acme), has prepared this Plan for the LGCCS for the Site. This LGCCS Plan was prepared based on PES' review of the landfill design, fill progression, and operation as contained in the information available to PES, and has been certified by a Professional Engineer.

2.0 EXISTING SITE CONDITIONS

2.1 Site description

Acme operates a MSW landfill located at 123 Anywhere Street, Anytown, Ontario under the following MOE C of A:

- C of A for a Waste Disposal Site (C of A (Waste)) No. 5555-5A5AA5.

The Site accepts solid non-hazardous wastes from Anytown, Ontario and the surrounding area. Landfill operations at the Site include:

- waste handling (tipping, covering, and compacting);
- landfill cell construction;
- hauling of construction and cover materials;
- leachate collection and management; and
- equipment maintenance operations.

The Site opened in 1990 and contains approximately 1.8 million tonnes of waste in place to the end of 2007. The total area of the Site is approximately 49.5 hectares.

2.2 Sub-Surface Soil Conditions

The site is located over a fine-grained clayey soil ranging approximately between 11 to 16 metres (m) in thickness. A detailed description of the sub-surface soil conditions for the Site is discussed in the hydrogeological assessment for the site.

2.3 Leachate Levels

Based on historical data, the leachate level at the site is approximately 3 to 5 m below surface.

3.0 FUTURE SITE DEVELOPMENT

3.1 Landfill Development Plan

The landfill is an engineered site with controls such as a liner system and a leachate collection system (LCS). The Site was designed and built as discussed in the Site's Design and Operations Plan (Site D & O Report).

There are currently a total of four cells permitted for accepting waste at the Site as shown on Plan 1 - Existing Conditions, in Appendix A - Landfill Gas Collection and Control System Design Plans. The existing landfill consists of completed cells 1 and 2, which have final cover applied which consists of 0.60 m of clay material and 0.15 m of top soil. Landfilling operations in cell 3 began in early 2008. A total of approximately 2.3 million m³ of waste has been placed in cells 1 and 2. The total permitted capacity of the Site is 3.9 million m³. Based on the current rate of waste fill, the Site is expected to close in 2014. The total area of the waste fill area is approximately 23.5 hectares.

Development of the Site will include the installation of an active LGCCS. Installation of the LGCCS will be undertaken in phases based on the development of the landfill. Vertical wells will be installed in completed cells 1 and 2. Horizontal collection trenches will be installed

during landfilling operations in cells 3 and 4. The first phase of the LGCCS will consist of the vertical wells which will be installed in early 2010.

A complete set of civil design drawings for the proposed LGCCS is included in Appendix A - Landfill Gas Collection and Control System Design Plans.

3.2 Landfill Gas Production Assessment

LFG is produced as a result of the biological decomposition of waste in a landfill. LFG composition is highly variable and depends on a number of site-specific conditions including solid waste composition, density, moisture content, and age. LFG is a mixture of gases that include methane (CH₄) and carbon dioxide (CO₂), each at approximately 50 percent each by volume, as well as trace quantities of other gases such as hydrogen sulphide (H₂S), mercaptans, and non-methane organic compounds (NMOC).

In the absence of Site-specific monitoring data, predictive models can be used to estimate LFG generation rates for the Site. There are numerous models available for estimating rates of production of LFG. Accepted industry standard models are generally first order kinetic models that rely on a number of basic assumptions. These models are used to predict the variation of LFG generation rates with time for a typical unit mass of solid waste. This generation rate curve is then applied based on records (or projections) of solid waste filling at a site to produce an estimate of the site's LFG production rate over time. It is important to note that the results obtained from these models represent estimated production rates. Actual recovery rates will vary as dictated by the actual LFG production rate and by the recovery efficiency of the LGCCS. Reported recovery efficiencies for typical landfills range from 60 to 80 percent, and 75 percent is typically assumed in the absence of site-specific data.

A LFG production assessment was conducted for the Site as part of the Site D & O Report dated January 1990, which forms part of the supporting documentation for the Site C of A (Waste). The original LFG production assessment has been updated for the purposes of this Plan, in accordance with modelling procedures as outlined in the MOE "Interim Guide to Estimate and Assess Landfill Air Impacts, October 1992" (Interim Guide). A figure illustrating the results of the LFG production modelling for the Acme Landfill is presented in Appendix B - Landfill Gas Production Modelling.

Based on Site-specific conditions, consideration of the LFG production processes, and PES' observation of conditions experienced at various Ontario landfills, it was considered appropriate to use the Scholl Canyon model with the MOE default model parameters presented in the Interim Guide in order to provide an estimate for LFG production at the Site. Historical waste quantities were used to estimate LFG production up to the current year with future waste deposition rates extrapolated based on annual acceptance rates and total waste volumes expected for the Site.

The peak estimated LFG production rate for the Site is approximately 2,510 cubic metres per hour (m³/hr) [(1,480 cubic feet per minute (cfm))]. It is noted that the peak LFG production occurs at Site closure.

Methane is recognized as a greenhouse gas (GHG) and contributes to the global warming potential (GWP) of the atmosphere. The global warming potential of methane is 21 times that of carbon dioxide on a 100-year time horizon.

It is noted that the equivalent peak estimated GHG emission reduction for the Site by flaring or utilization is approximately 114,000 tonnes CO₂. This calculation is based on a conservative LFG collection efficiency of 75 percent, destruction efficiency of the LGCCS equipment of 99 percent, and methane density of 0.6557 kg/m³.

3.3 Landfill Gas Migration Assessment

An assessment of the potential for subsurface migration of LFG was included as part of the Site D & O Report. As outlined in the Site D & O Report, subsurface migration of LFG has not been a concern at the Site based on the fine-grained, clayey soil predominating in the fill area. However, the potential still exists for the migration of LFG through any disturbed subsurface soil surrounding the landfilled areas of the Site. Possible conditions that may allow for LFG accumulation and migration include frozen ground and flow along preferential pathways or conduits.

The migration of LFG through the soil poses two primary concerns, both of which are related to build-up of gases within or below structures near the landfill. Firstly, accumulation of LFG in a subsurface structure or confined space (e.g., basement, buried manhole, etc.) may expose those required to enter the structure to an oxygen deficient environment created by the presence of LFG. Secondly, accumulation of LFG in low-lying areas or within buildings introduces the risk of an explosion if a source of ignition is present. Depending upon the proportions of the two major constituents of LFG (CO₂ and CH₄), it can either be lighter or heavier than air and, therefore, may accumulate in structures or low-lying areas. Should there be a continuing source of LFG, the hazard may be significant given that methane is explosive in the range between approximately 5 to 15 percent by volume in air.

The potential for subsurface migration of LFG at the Site has been monitored twice per year, from 1990 to 2008. The locations of the LFG migration monitoring probes are presented on Plan 1 - Existing Conditions, in Appendix A - Landfill Gas Collection and Control System Design Plans. There has been no evidence of LFG migration from the waste fill area. Combustible gas meters have been installed in all of the on-Site buildings as an additional precaution to detect potential subsurface LFG migration. To date, no detections of combustible gas have been noted with the building methane monitoring systems. A building combustible gas response protocol was included in the Site D & O Report.

Combustible gas meters will be installed in any new buildings constructed at the Site and monitoring of the LFG migration probes will continue on a semi-annual basis in accordance with the Site D & O Report.

4.0 LANDFILL GAS COLLECTION AND CONTROL SYSTEM DESIGN

The design of the LGCCS for the Site was prepared in accordance with the "MOE Landfill Standards Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites, May 1998" (Landfill Standards Guideline). In accordance with the Landfill Standards Guideline, the following are some of the factors that were taken into consideration as part of the design of the LGCCS:

- landfill liner system for the Site preventing lateral migration of LFG;

- prevailing leachate levels within the landfill including presence of any elevated or perched water;
- Site configuration including landfill slopes, vertical configuration relative to surrounding ground surface, and landfill surface area relative to volume of waste;
- final cover characteristics and limitations affecting moisture within the Site and potential air intrusion;
- phasing of landfilling and closure operations for each area of the Site;
- type and procedures for daily or intermediate cover affecting hydraulic and LFG movement within the landfill;
- activities to control or alter the moisture content within the landfill as applicable; and
- disposal methods for any sludge or liquid waste.

The LGCCS has been designed with sufficient capacity to control LFG generated in the approved Site capacity and in accordance with landfill development and operating principles. Thus, the LGCCS has been designed to accommodate the peak estimated LFG production rate of 2,510 m³/hr (1,480 cfm), assuming a normalized methane concentration of 50 percent by volume. The following subsections discuss the design of the LGCCS and various LGCCS components.

The primary objectives for LFG management at the Site are to:

- comply with applicable regulations;
- provide long-term control of potential LFG emissions to the atmosphere at a level that is considered the maximum feasible;
- assist with migration control; and
- if feasible, provide opportunity for generation of revenue through LFG utilization.

The major components of the LGCCS include the following:

- Collection well field - removes LFG from the waste within the limit of waste and includes collection piping to convey LFG from the collection well field to the LFG management facility;
- LFG management facility - houses mechanical and electrical components required for the extraction and delivery of LFG for disposal by flaring;
- Condensate handling facilities - removes liquid condensate from the LGCCS and directs the condensate to the existing leachate collection system; and
- LFG utilization facility - future facilities contemplated for processing and utilization of the collected LFG in an environmentally sound fashion.

It is noted that utilization of the LFG will not be undertaken at the current time, however, the viability of LFG utilization to generate electricity will be considered from time to time as warranted by changes in economic and market conditions.

The following subsections describe the conceptual design of each of the major components of the LGCCS. Figure 4.1 - Process Schematic, presents a process schematic of the LGCCS while associated engineering design calculations are presented in Appendix C - Engineering Design Calculations.

4.1 Collection Well Field

The primary components of the LFG collection well field include the following:

- vertical wells;
- horizontal trenches; and
- LFG collection/transmission piping.

4.1.1 General

Collection well fields may consist of horizontal trenches, vertical extraction wells, or combinations of both. Horizontal trench systems must be installed during landfilling operations. Vertical extraction wells can be installed subsequent to reaching final grade elevations. Based on the current development of the Site, vertical wells will be installed in the completed portions of cells 1 and 2, and horizontal trenches installed in developing cells 3 and 4.

A total of 23 vertical extraction wells will be installed as part of the first phase of construction of the LGCCS. Subsequent phases of the LGCCS construction will include the installation of a total of approximately 8 horizontal trenches that will be brought online as LFG collection becomes feasible in that area of the landfill. Additional LFG vertical wells may be installed as dictated by the operation of the LGCCS. A plan showing the layout of the proposed LGCCS is shown on Plan 2 - Proposed LFG Collection Well Field, in Appendix A - Landfill Gas Collection and Control System Design Plans.

The arrangement of vertical wells and horizontal trenches at the Site is designed to optimize the collection of LFG by maximizing the radius of the capture zone or 'radius of influence'. The radius of influence is considered to be the area of waste in which a negative pressure gradient may be induced by the blower.

The actual radius of influence that may be achieved is largely dependent on Site characteristics such as the composition, density, moisture content, condition, and permeability of the solid waste and cover materials. The actual radius of influence is also dependent on the vacuum applied at the wellhead, barometric pressure, availability of LFG, and preferential pathways for gas movement (McBean et al, 1995).

Engineering experience at other similar sites indicate that application of up to about 10 to 15 inches of water column (in. W.C.) vacuum on a vertical well is sufficient to induce reasonable radius of influence of approximately 30 m at most sites. A vacuum of 10 to 15 in. W.C. represents a reasonable compromise between maximizing radius of influence and minimizing air intrusion into the Site, while using economical LFG extraction equipment. It is noted that the radius of influence for a well may range from less than 30 m up to 150 m (Environment Canada, 1996).

Similar vacuum applied to a horizontal trench will induce a reasonable radius of influence of approximately 30 m in the horizontal direction. The radius of influence in the vertical direction may be reduced due to the permeability of the waste which generally decreases as the age and depth of the waste increases. It is noted that the horizontal permeability of refuse may be up to ten times greater than the vertical permeability (Environment Canada, 1996).

A plan showing the layout of the proposed LGCCS including the radius of influence for the LFG collection well field is shown on Plan 3 - Proposed LFG Collection Well Field Details.

4.1.2 Vertical Wells

LFG collection through the use of vertical wells uses the following:

- a network of vertical extraction wells; and
- a system of lateral /subheader piping.

A design spacing of 60 m was selected for the initial installation of vertical wells, based on a conservative estimate for the radius of influence of 30 m. This allows flexibility for future expansion, i.e., installation of additional wells, to obtain a more effective LFG control level. The general layout of wells will be in a grid pattern with a successive row of wells offset 30 m laterally from the preceeding row. The layout of the vertical wells is shown on Plan 2 - Proposed LFG Collection Well Field, in Appendix A - Landfill Gas Collection and Control System Design Plans. The initial design layout will allow additional vertical wells to be added to the collection well field as dictated by the field monitoring discussed in Section 6.0 to obtain a more effective LFG control level.

Operating experience at other landfill sites indicates individual well flow rates in the range of 17 to 85 m³/hr (10 to 50 cfm). Based on the age of the waste at the Site in the areas where the vertical wells will be installed, a representative estimate of 50 m³/hr (30 cfm) per well was chosen for the preliminary design of the vertical extraction wells.

The vertical wells installed at the Site would be constructed with the following design elements:

- Schedule 80 PVC equipped with a telescoping slip joint to allow for landfill settlement;
- wells drilled to a depth of approximately 15 m below ground surface; but at least 2 m from the top of the LCS to ensure the base of the landfill is not penetrated;
- encased in a gravel drainage pack throughout the perforated well section;
- well perforation sizes selected such that intrusion of mud and other particulates are minimized;
- minimum 1 m bentonite seal to minimize air intrusion into the well and LGCCS;
- wellhead equipped with a slip cap to allow sounding of leachate levels;
- control valve to facilitate well field balancing and regulation of flow;
- wellhead equipped with sample ports both upstream and downstream of the control valve to monitor the pressure and quality of LFG; and
- wellheads installed in below-grade chambers to protect them from the elements and from tampering by non-authorized personnel.

The vertical wells will be constructed with solid pipe extending down from the landfill surface with perforated collection pipe below. The length of the perforated pipe has been maximized to enhance the effectiveness of LFG collection. The length of the solid pipe will be 4 to 6 m to minimize intrusion of air into the landfill and LGCCS. PVC was selected as the material of construction for its rigidity and chemical compatibility with LFG.

The vertical wells allow the flexibility to adjust gas extraction from specific areas of the Site, if needed. As indicated above, each well will be equipped with a valve and monitoring instrumentation to allow for adjustment of the well field to suit variations in gas production at different locations on the Site. This would allow for efficient LFG control operations by providing the ability to vary each well's radius of influence.

Non-perforated subheaders will connect the wells and span the filling surface of the Site. The subheaders would convey the LFG to the limit of waste for transmission to the LFG management facility via the main LFG collection header.

Details of the vertical wells and subheader piping are included on Plan 10 - LFG Extraction Well Details, and Plan 11 - Horizontal LFG Collection Trench and LFG Header Pipe Details.

4.1.3 Horizontal Trenches

LFG collection through the use of horizontal collection trenches includes the following:

- a network of horizontal collection trenches placed during landfilling; and
- a system of buried subheader piping to the main LFG collection header.

Horizontal collection trenches will be placed at the Site at various locations and elevations within the waste fill area, in consideration to the active landfilling operations. Horizontal trenches have proven to be an effective means of collecting LFG progressively during active landfilling, supplementing the effective control that vertical extraction wells provide.

Similar to the vertical wells, a horizontal design spacing of 60 m was selected for the trenches, with successive layers of trenches offset 30 m horizontally. A vertical spacing of 8 to 12 m for successive layers of trenches was selected in consideration of Site operations including waste and cover type, filling practices, and vertical permeability of the waste.

A plan showing the design layout of the horizontal collection trenches is provided on Plan 2 - Proposed LFG Collection Well Field, in Appendix A - Landfill Gas Collection and Control System Design Plans. Based on the condition and operations of the Site and experience at other similar sites, the following installation guidelines are to be utilized for the horizontal trenches for the Site:

- trenches to run generally perpendicular to the filling direction to allow the installation to be completed in a practical manner;
- minimum length of perforated portion of trench will be approximately 50 m; and
- typically minimum 6 m of cover over trenches at the transition from perforated to solid pipe.

The horizontal collection trenches will be constructed with perforated HDPE of two separate diameters to provide a consistent overlap of piping along the length of the trench and allows for overall and differential settlement of the landfill. The horizontal collection trenches will be backfilled with a clear stone/aggregate to facilitate collection and conveyance of LFG. At the end of the horizontal collection trenching, a section of solid HDPE pipe will be fused to the perforated piping to minimize infiltration of air into the collection system at the side slopes of the landfill. This section of solid HDPE piping will be sloped either towards the LFG header piping to convey collected condensate to the condensate handling facilities (i.e., condensate traps) or back towards the landfill to prevent leachate from entering the LGCCS. This will be dependent on the vertical elevation of the horizontal trenches when installed, i.e., whether the trench is above or below the elevation of the main LFG collection header. HDPE was selected as the material of construction due to its physical strength, flexibility, and chemical compatibility with LFG.

The horizontal trenches will be tied into the existing header pipe of the LGCCS on the south side, with the header along the north section of the Site extended as new horizontal trenches are

brought online. Each horizontal trench will incorporate a control valve and monitoring assembly. The control valve and monitoring assembly allows the operator to control and monitor the flow of LFG from the waste into the transmission piping in a similar manner to the vertical extraction well installation.

Details of the vertical wells and subheader piping are included on Plan 11 - Horizontal LFG Collection Trenches and LFG Header Pipe Details.

4.1.4 Well Field Piping

The LFG collection pipe network is designed to transport LFG from the vertical wells and horizontal trenches to the LFG management facility. The proposed LFG collection pipe network includes the following:

- small diameter laterals that connect the individual wells to a subheader pipe;
- subheader pipes that connect groups of wells to the main header pipe; and
- main header pipe that transports the LFG from the subheaders to the LFG management facility.

The primary considerations and constraints governing the design of the LFG piping system are as follows:

- provide sufficient flow capacity to allow for transmission of peak LFG rates and application of adequate vacuum at all points in the LFG collection well field to ensure that the effective radius of influence of the LFG wells can be maintained;
- ensure chemical compatibility of piping and components with LFG, condensate, and the landfill environment; and
- grade pipelines to allow for drainage of liquids and to allow for the effects of landfill settlement.

Pipe sizes have been selected to convey the anticipated quantities of LFG with manageable frictional pressure losses to both ensure low-pressure blowers can be utilized and to facilitate well field balancing. As indicated in Section 4.0, the header pipe will be sized for a maximum design flow of 2,510 m³/hr (1,480 cfm).

In accordance with "CAN/CGA-B105-M93 Code for Digester Gas and Landfill Gas Installations, A National Standard of Canada (Reaffirmed 2007)" (Gas Code), all LFG well field piping shall be composed of SDR 26 HDPE. Buried pipe strength calculations for piping located in native soil, located within the limit of waste, and under various traffic loading conditions are included in Appendix C - Engineering Design Calculations.

LFG collection piping will be buried to guard against movement resulting from thermal contraction and expansion, and to provide insulation to guard against exposure to low temperatures that could result in condensate freezing on the pipe walls. Where feasible, the minimum burial depth will be approximately 1 m.

All well field piping will be adequately graded to facilitate condensate management, discussed in Section 4.3. Piping will be installed in accordance with the following grade requirements:

- piping located in native soils will maintain a minimum grade of 0.5 percent for condensate drainage in the direction of LFG flow;

- piping located in native soils will maintain a minimum grade of 2 percent for condensate drainage against the direction of LFG flow; and
- piping located within the limit of waste will maintain a minimum grade of 3 to 5 percent to account for landfill settlement.

The design layout of the LFG piping network proposed to service the LFG collection well field is presented on Plan 2 - Proposed LFG Collection Well Field and Plan 3 - Proposed LFG Collection Well Field Details, in Appendix A - Landfill Gas Collection and Control System Design Plans. The subheaders conveying LFG from the vertical wells and horizontal trenches will be connected to the main LFG header pipe at the limit of the waste to carry the LFG to the proposed LFG management facility. The LFG main headers will run along the northern, southern and western limits of the Site, as shown on Plans 2 and 3. Plan and profile drawings of the main LFG collection header are presented on Plans 4 through 9 - Plan and Profile Chainage 0+000 to 1+320.

Construction of the LFG piping network in cells 3 and 4 will be phased to follow the filling schedule of each cell. The end of each advanced header section, as well as piping from the valve chambers, would be temporarily capped, awaiting future connections. The LFG collection well field piping will be equipped with tracer wire for locating buried piping, and seepage collar to prevent leachate seeps through the side slopes. The granular bedding for the pipe trenching will be adequately compacted to minimize settlement of the piping.

Details of the lateral, subheader, and main LFG header piping and trenches are shown on Plan 11 - Horizontal LFG Collection Trenches and LFG Header Details.

4.1.5 Subheader Valve Chambers

A subheader valve chamber is located at the end of each subheader piping, identified as VC-1 to VC-12 on Plan 2 - Proposed LFG Collection Well Field and Plan 3 - Proposed LFG Collection Well Field Details in Appendix A - Landfill Gas Collection and Control System Design Plans. The installation details of the subheader valve chambers are presented on Plan 12 - Valve Chamber Details.

Each subheader valve chamber is comprised of an HDPE vault box that contains a 150 mm diameter control valve, which controls the flow of LFG from the collection well field to the main header pipe. Each subheader valve chamber contains sample ports that permit monitoring of LFG pressure and quality.

4.2 LFG Management Facility

The LFG management facility includes the mechanical and electrical components of the LGCCS to actively collect LFG from the Site. The primary components of the LFG management facility for the Site will include the following:

- two 2,700 m³/hr (1,600 cfm) blowers (one acting as a standby);
- provisions for space for a future blower;
- one 2,700 m³/hr (1,600 cfm) flare;
- monitoring instrumentation including programmable logic controller (PLC) and supervisory control and data acquisition (SCADA) systems; and
- enclosed building to house the mechanical and electrical components of the system.

The size of the blower and flare components have been selected to accommodate the peak estimated rate of LFG production of 2,510 m³/hr (1,480 cfm) as well as consideration of commonly available sizes of blower and flare equipment. The LFG management facility will be located between the waste fill area and the main administration building, as shown Plan 2 - Proposed LFG Collection Well Field and Plan 3 - Proposed LFG Collection Well Field Details in Appendix A.

4.2.1 LFG Blower

The two blowers will be installed in the blower room of the LFG management facility building, configured as prime and standby whereby only one blower will normally run at any given time. Sufficient space has been provided for one additional blower to be installed as a future contingency for expansion.

The LFG blower selected will be a centrifugal blower with a flow capacity of 2,700 m³/hr (1,600 cfm) per unit. Each blower will also be controlled by a variable frequency drive (VFD) to allow manual flow control of the blower to accommodate for changes in LFG available from the LFG collection well field.

The blower motor will be rated explosion proof and suitable for Class I, Division I, Group D, hazardous location applications. Flexible connections for both the inlet and outlet of the blower will absorb vibrations during operation and prevent the transmission of vibrations to the LFG management facility piping.

In accordance with the Gas Code, each blower will be equipped with a plug valve on the inlet and outlet connection to the header pipelines for isolation purposes or to allow manual throttling of the blower if necessary.

The blowers will be of spark resistant construction and all components coming in contact with the LFG will be corrosion resistant. The blower will also be equipped with shaft seals to minimize leakage of LFG or air out of or into the blower housing. It should be recognized that shaft seals cannot be constructed completely gas tight and some minimal leakage may occur.

A check valve will be provided on the outlets of each blower. The check valves will prevent backflow of LFG through the blower.

The plant inlet and outlet line will be equipped with a vacuum or pressure gauge, respectively, to monitor blower performance.

4.2.2 Enclosed Flare

One enclosed flare will be installed on a reinforced concrete foundation adjacent to the LFG management facility building. The flare system will be designed to provide effective high temperature combustion of LFG in a controlled environment to destroy the potentially harmful constituents of LFG. The LFG flare will consist of a natural draft enclosed flare with a multi-orifice burner and burner chamber enclosed in a stack containing refractory insulation. The flare stack will be approximately 3 m in diameter with an approximate height of 9 m, such that the flame will not be visible at the top. It will be specified to provide sufficient retention time for destruction of compounds in the gas. Based on experience with similar LGCCS at other

sites, it is anticipated that the MOE will require a retention time of 0.75 seconds at a temperature of 875°C as operating parameters for the flare.

The flare unit will incorporate the following components:

- thermal valve and flashback flame arrestor;
- propane pilot system;
- flame scanner;
- air inlet/temperature control dampers;
- purge blower; and
- thermocouples.

The flare will have a capacity of 2,700 m³/hr (1,600 cfm) of LFG.

Flame temperature will be controlled by a system of automatically and manually controlled air inlet dampers and thermocouples located in the stack.

Immediately downstream of the flare control valve, a flame arrestor and thermal valve combination will be installed. This is a safety device that will be used to prevent rearward propagation of the flame from the flare into the plant piping. The flame arrestor body contains a bank of stainless steel sheets laid one on top of the other which effectively dissipates the heat should the flame burn back into the piping. The thermal valve contains a fusible link that melts in the event of a flame burn back, shutting the valve.

The flare will be equipped with an automatic propane pilot system that is controlled by the main system PLC.

The flare will be equipped with a purge blower as a safety feature that is used during the start cycle to purge trace LFG from the flare prior to ignition.

The enclosed flare is considered to be the best available control technology for the Site. High temperature flaring of LFG results in conversion of the CH₄ component of the gas to CO₂ and water. The trace compounds in the LFG are largely destroyed. With high temperature and controlled combustion, emissions from LFG flares have been found to meet stringent MOE criteria and provide destruction efficiency of greater than 99 percent for methane and other VOCs.

4.2.3 Monitoring Instrumentation

The LGCCS will be equipped with a LFG analyzer and flow meter. The purpose of the LFG analyzer is to monitor the methane (CH₄), oxygen (O₂), and carbon dioxide (CO₂) concentrations for system diagnostic and performance purposes, in order to supplement the regular well field monitoring that is conducted for the LGCCS as discussed in Section 6.0. In addition, continuous monitoring of methane concentration and flow measurements are required for the sale of any potential GHG emission reduction credits that may result from operation of the flare. Detailed specifications for the LFG analyzer and flow meter including recording frequency of the monitoring parameters will be developed in consideration of these monitoring requirements as well as future LFG utilization.

4.2.4 Blower Building

The LFG management facility building will contain a blower room and electrical room. The adjacent LFG compound will contain the flare, which will be enclosed by a chain link fence with access gates. Area lighting will be provided. The blower room electrical systems will be designed to meet the Electrical Safety Code and the intent of the Gas Code.

The electrical room will house the lighting panel and electrical controls including the central PLC system for control of the blower/flare system. Remote annunciation will be provided to alert operations staff of a plant alarm or shutdown.

As previously discussed in Section 3.4, it is not expected that LFG migration to the LFG management facility building will be of concern. However, the foundation for the blower and electrical rooms will be constructed with a passive LFG venting system. As an added precaution all joints in the floor slabs will be sealed to inhibit migration of gas from beneath the building into the interior spaces. The LFG management facility building will also be equipped with an online methane gas detection system.

4.3 Condensate Handling

Condensate management is a critical component in the design of the LGCCS. As LFG is extremely moist, it produces condensate within the LFG transmission piping. The transmission piping will be sloped to drain condensate towards areas where it can be collected and subsequently handled. All of the piping has been designed to prevent the collection of condensate within the piping, which in adverse conditions, can minimize and in some extreme cases, prevent gas flow through the transmission piping.

The characteristics of condensate are highly variable, but are considered similar to that of leachate. Once removed from the system, condensate will be collected and managed as leachate. To dispose of collected condensate in an environmentally sound manner, it will be directed back into the existing leachate collection system. Condensate drained from the subheader or lateral piping into the header will be handled by use of condensate traps along the main header. The header piping will be sloped to allow conveyance of condensate to the condensate traps where it will be collected and pumped through HPDE piping to an adjacent leachate manhole.

To provide sufficient drainage of condensate from the LGCCS piping, condensate sumps (i.e., trap) have been constructed at all low points in the piping system to drain condensate and prevent flooding of pipelines. Each of the condensate traps will be equipped with an interior "p-trap" the depth of which will exceed the operating vacuum of the collection system. In this way, condensate can be continuously drained and conveyed to the Site leachate collection system without interrupting the operation of the LGCCS.

Each of the condensate traps have been placed at approximate intervals of every 300 m as shown on Plan 2 - Proposed LFG Collection Well Field and Plan 3 - Proposed LFG Collection Well Field Details, in Appendix A - Landfill Gas Collection and Control System Design Plans. Each of five condensate traps will be equipped with automatic level controls and a submersible pump. High and low float levels within the condensate trap sump will trigger when pumping should occur. The condensate forcemain at each chamber will consist of HDPE piping and will be directed to the nearest leachate collection system manhole. Each condensate forcemain will be

equipped with a check valve to prevent the flow of leachate back to the condensate chamber. Design details for the condensate trap chambers have been included on Plan 13 - Condensate Trap Schedule and Details.

The quantity of condensate that is typically contained in LFG is approximately 20 to 40 mL per m³ (mL/m³) of LFG collected. Based on the dewpoint of LFG and the peak LFG design flow rate, the peak quantity of condensate to be collected and pumped is estimated to be approximately 1,400 liters per day.

5.0 SYSTEM OPERATION

The active collection of LFG at the Site is a continuous operation. It is expected that eventually operation of the LGCCS may be downgraded after Site closure to allow for intermittent or no operation. Evaluation of the need for continuous operation of the collection system would be carried out regularly until LFG collection declines below that which allows efficient operation of the collection field and flaring.

The LGCCS will be operated to minimize air intrusion into the system. The LFG extraction rate will be adjusted to vertical wells and horizontal trenches based on LFG available for collection.

A LGCCS Operation and Maintenance Manual for the LGCCS installed at the Site (LGCCS O & M Manual) will be developed following construction, which includes in detail well field monitoring requirements based on the specific components installed. Components of the LGCCS O & M Manual will include:

- LGCCS component overview;
- LFG collection well field description, operation, and control including monitoring and balancing procedures;
- LFG management facility, description, operation, and control including potential operational difficulties and troubleshooting procedures;
- condensate management facilities description, operation and control;
- system maintenance including manufacturer's inspection, calibration, and preventative maintenance requirements;
- alarm response protocols;
- system monitoring and reporting requirements; and
- LGCCS health and safety requirements.

6.0 SYSTEM MONITORING AND REPORTING

A routine monitoring program (LGCCS monitoring program) is required to verify that LFG is being effectively managed.

LFG monitoring programs currently ongoing at the Site include:

- LFG migration probe monitoring - semi-annual monitoring for pressure and gas concentration measurements. Results and analyses of this monitoring are presented in the Annual Progress Reports for the Site.

Additional monitoring activities for the LGCCS will be developed and implemented as a component of the installation, startup, and operations of the LGCCS as part of the LGCCS O & M Manual. The LGCCS monitoring program will include the following items:

- continuous online monitoring of collected LFG flow, CH₄, O₂, and CO₂ concentration of the LFG, and flare temperatures;
- monthly LFG collection well field measurements of CH₄, O₂, CO₂ and vacuum pressure;
- weekly inspections of the LFG management facility;
- annual general condition inspections of the LFG management facility; and
- annual sampling of LFG taken from a common system point (header).

The continuous online measurements of LFG flow, CH₄ and O₂ will be used to ensure that the LGCCS is operated to minimize air intrusion into the system.

Effective control of emissions to the atmosphere will be evaluated based on review of the following:

- semi-annual migration monitoring; and
- validated odour complaints related to the Site.

Validated odour complaints may provide an indicator to assess trends that may relate to the effectiveness of LFG collection. Review of odour complaints must also consider other possible sources of odour in the vicinity of the Site. In the event that odours are traced to LFG, they will act as a trigger to review the collection well field operation and to assess the need for installation of supplementary LFG collection features.

Trigger criteria for implementation of contingency measures such as re-balancing of the collection well field or modification of the installed LGCCS are discussed in Section 7.0.

In keeping with the current practice, modifications to the LGCCS monitoring program that may be required in the future will be presented as recommendations in the Annual Progress Reports that are subject to MOE review and approval in accordance with the Site D & O Report and C of A (Waste).

7.0 CONTINGENCY MEASURES

A Site contingency plan was developed as part of the Site D & O Report that includes provisions for management of LFG. Implementation of the contingency plan is a multi-step process which generally includes the following four steps:

Step 1 – Verification: Verify that trigger criteria have been exceeded through appropriate re-sampling and/or further evaluation. Consult with MOE upon verification that trigger conditions have occurred.

Step 2 – Assessment: Evaluate the likely source of the problem, including completion of additional monitoring or investigating required to complete the evaluation.

Step 3 – Evaluation: Review pre-determined contingency measures and any other potential solutions. Carry out further investigative/design tasks necessary to evaluate alternative solutions and to develop the selected contingency measure.

Step 4 – Implementation: Notify the MOE of the need to implement the contingency plan. Prepare detailed plans, specifications, and descriptions for the implementation, operation, and maintenance of the plan.

While going through the above process, if it is determined that no further action is warranted, the routine monitoring program will be re-implemented and re-evaluation of the trigger parameters and levels will be undertaken.

As outlined in Section 6.0, the primary triggers for implementing the Site contingency plan include the following two occurrences:

- subsurface migration of LFG from the Site into the surrounding native soil; and
- excessive emissions to the atmosphere resulting in LFG-related odours being emitted from the Site.

The specific trigger criteria used to verify these occurrences includes the following:

- a reading of greater than 50% of the lower explosive limit (LEL) for methane in the on-Site migration monitoring probes (i.e., greater than 2.5% methane by volume); and
- receipt of validated odour complaints.

Landfills typically emit two types of odours; waste odour and LFG odour. Waste odour is generated by recently disposed waste and can be controlled by the application of daily cover. LFG odour is generated during the anaerobic decomposition of organic waste material.

During operation of the Site personnel have addressed waste odour sources by placing and maintaining adequate cover material on active areas. The placement of adequate daily cover will continue to be employed during operation of the Site to minimize potential waste odour generation.

A number of contingency actions may be initiated to augment LFG collection if required. These contingency actions include the following:

- replacement of failed extraction wells with the installation of additional wells;
- installation of additional extraction wells in areas with insufficient extraction;
- increase of LFG extraction vacuum and/or repairing of the Site cover to reduce intrusion of air into the waste;
- re-balancing of the collection well field to ensure maximum collection efficiency;
- supplemental evaluation of landfill cover based on surface emission monitoring; and
- excavation and installation of shallow horizontal trenches below the final cover during closure activities in completed portions of the landfill.

The MOE will be notified prior to the implementation of any change to the design or operation of the LGCCS as outlined in this Plan.

8.0 FINANCIAL ASSURANCE

Financial assurance requirements for the LGCCS will be updated in accordance with procedures in the Site D & O Report and Site C of A.

9.0 SYSTEM INSTALLATION

Prior to system installation, an odour, noise, dust, and sediment control plan shall be submitted to the Director for approval. No construction shall commence until the plan is approved.

10.0 REFERENCES

Canadian Standards Association (CSA). *CAN/CGA-B105-M93 Code for Digester Gas and Landfill Gas Installations, A National Standard of Canada*. Reaffirmed 2007.

Environment Canada. *Guidance Document for Landfill Gas Management*. March 1996.

McBean, E.A., Rovers, F.A., Farquhar, G.J. *Solid Waste Landfill Engineering and Design*. Prentice-Hall, Inc. 1995.

MOE. *C of A Waste Disposal Site No. 5555-5A5AA5*. January 1990.

MOE. *Interim Guide to Estimate and Assess Landfill Air Impacts*. October 1992.

MOE. *O. Reg. 216/08, Amending O. Reg. 232/98*. June 2008.

MOE. *O. Reg. 217/08, Amending R.R.O. 1990 Reg. 347*. June 2008.

MOE. *O. Reg. 232/98 Landfilling Sites*. June 2008.

MOE. *R.R.O. 1990 Reg. 347 General – Waste Management*. June 2008.

MOE. *The Landfill Standards Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites*. May 1998.

PES. *Design and Operations Report for the Acme Landfill Site*. January 1990.

PES. *Annual Progress Reports for the Acme Landfill Site*. 1990 to 2007.

Prepared By:

Jack Worker

Jack Worker

P.E.S. Waste Management Ltd.

Approved by:

Joe Consultant

Joe Consultant

P.E.S. Waste Management Ltd.

TABLES

Table 1.1

Regulatory Compliance
Landfill Gas Collection and Control System
Acme Landfill
Anytown, Ontario

Regulatory Citation	Report Reference	Regulatory Requirements	ACME Landfill
O. Reg. 347 §11.1(1)	Section 1.0	<p>The owner and the operator of a landfilling site described in subsection (2) shall ensure that on or before June 30, 2009, a written report is submitted to the Section 39 Director respecting,</p> <p>(a) the design, operation, maintenance and monitoring of the facilities for the collection, and for the burning or use, of landfill gas generated by the site during site operation and following site closure; and</p> <p>(b) if any of the facilities referred to in clause (a) already exist, the improvements, if any, that can be made to those facilities to increase the amount of landfill gas generated by the site that can be collected, and burned or used, and the date by which the improvements can be made and implemented.</p>	An explanation of the new amendment has been provided explaining the changes to O. Reg. 347 and O. Reg. 232/98 and
O. Reg. 347 §11.1(2)	Section 1.0	<p>This section applies to a landfilling site that meets the following criteria:</p> <ol style="list-style-type: none"> 1. The site accepts only municipal waste for disposal. 2. On or after June 30, 2009, the site will landfill waste under a certificate of approval or provisional certificate of approval issued under Part V of the Act. 3. On or after June 30, 2009, the site will have a total waste disposal volume of more than 1.5 million cubic metres. 4. A written report has not been required to be prepared with respect to the site under subsection 15 (1) of Ontario Regulation 232/98 (Landfilling Sites) made under the Act. 	

Table 1.1

Regulatory Compliance
Landfill Gas Collection and Control System
Acme Landfill
Anytown, Ontario

Regulatory Citation	Report Reference	Regulatory Requirements	ACME Landfill
O. Reg. 347 §11.3(1)	Section 1.0	<p>Subject to subsection (2), the owner and the operator of a landfilling site to which section 11.1 or 11.2 applies shall ensure that the following facilities and improvements to the facilities are in operation for the collection, and for the burning or use, of landfill gas generated by the site during site operation and following site closure:</p> <p>1. If section 11.1 applies, the facilities referred to in clause 11.1 (1) (a) and any improvements identified under clause 11.1 (1) (b).</p> <p>2. If section 11.2 applies, the facilities referred to in clause 11.2 (1) (c) and any improvements identified under clause 11.2 (1) (d).</p>	
O.Reg. 232/98 §14.(2)	Section 3.0	<p>The design of the site and any plans, specifications and descriptions for the control of landfill gas must ensure that the subsurface migration of landfill gas meets the following conditions:</p> <p>1. The concentration of methane gas below the surface of the land at the boundary of the site must be less than 2.5 percent by volume.</p> <p>2. The concentration of methane gas must be less than 1.0 per cent by volume in any on-site building or enclosed structure, and in the area immediately outside the foundation of basement floor of the building structure, if the building structure is accesible to any person or contains electrical equipment or a potential source of ignition.</p> <p>3. Paragraph 2 does not apply to a leachate collection, storage or treatment facility or landfill gas collection or treatment facility for which specific health and safety measures and procedures are in place relating to the risk of asphyxiation and the risk of explosion.</p>	A landfill gas migration assessment for the Site is included as part of this Design and Operations Report.

Table 1.1

Regulatory Compliance
Landfill Gas Collection and Control System
Acme Landfill
Anytown, Ontario

Regulatory Citation	Report Reference	Regulatory Requirements	ACME Landfill
		4. The concentration of methane gas from the site must be less than 0.05 per cent by volume in any off-site building or enclosed structure, and in the area immediately outside the foundation or basement floor of the or structure, if the building or structure is accessible to any person or contains electrical equipment or a potential source of ignition. O. Reg. 232/98, section 14.	
O. Reg. 232/98 §17(1)	Section 8.0	The owner and the operator of a landfilling site shall ensure that financial assurance is provided for the contingency plans for the site, including the construction, operation, maintenance and replacement of works required by the contingency plans.	Financial assurance requirements for the Site have been updated in accordance with provisions in the Design and Operation Report for the ACME Landfill Site, forming part of the Site Certificate of Approval (Waste).

FIGURES

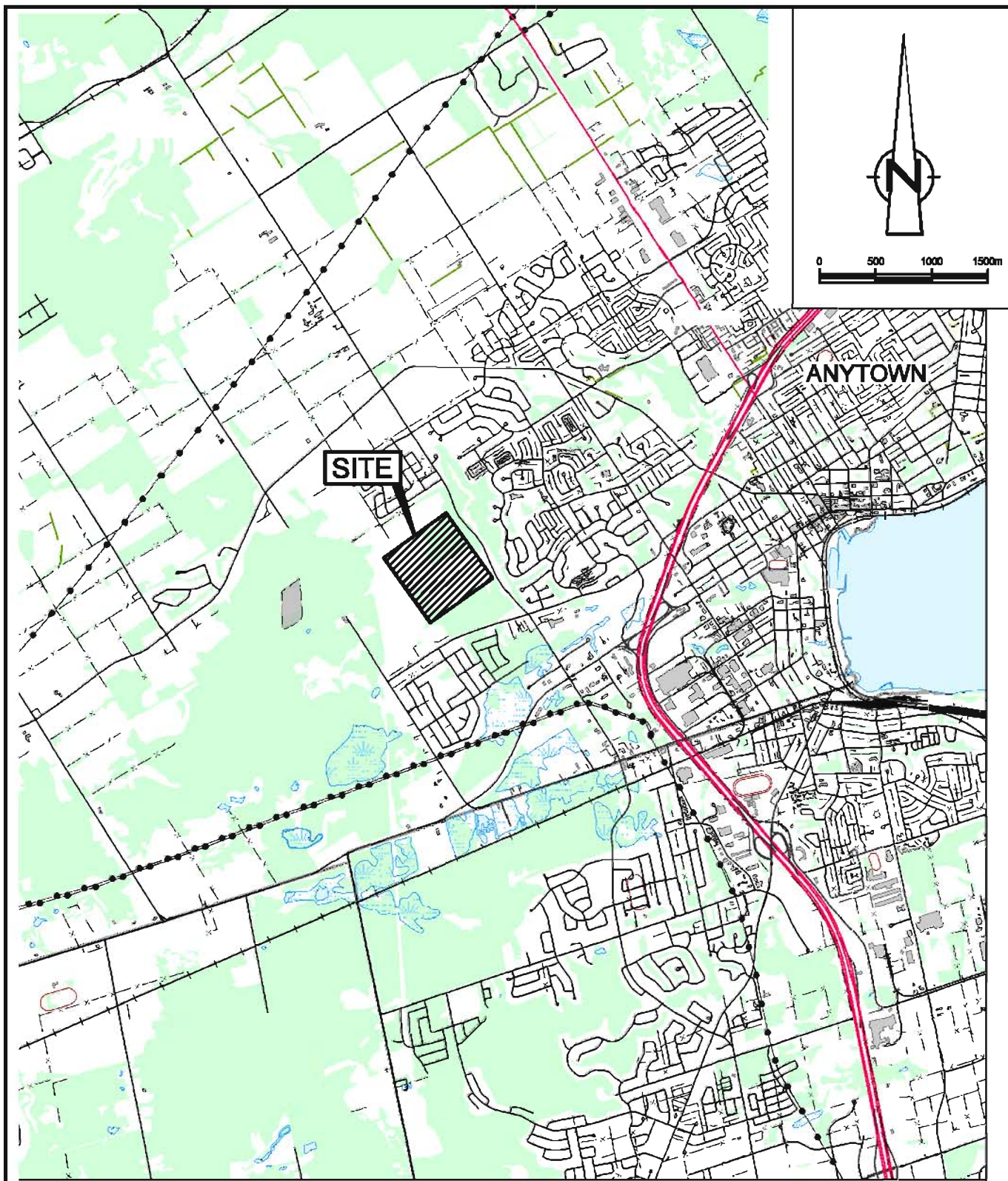


figure 1.1

SITE LOCATION PLAN
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
ACME LANDFILL
Anytown, Ontario



LEGEND

- P — PROPANE GAS LINE
- L — LFG LINE (VACUUM)
- L — LFG LINE (PRESSURE)
- CONDENSATE DRAIN LINE
- ⋈ VALVE

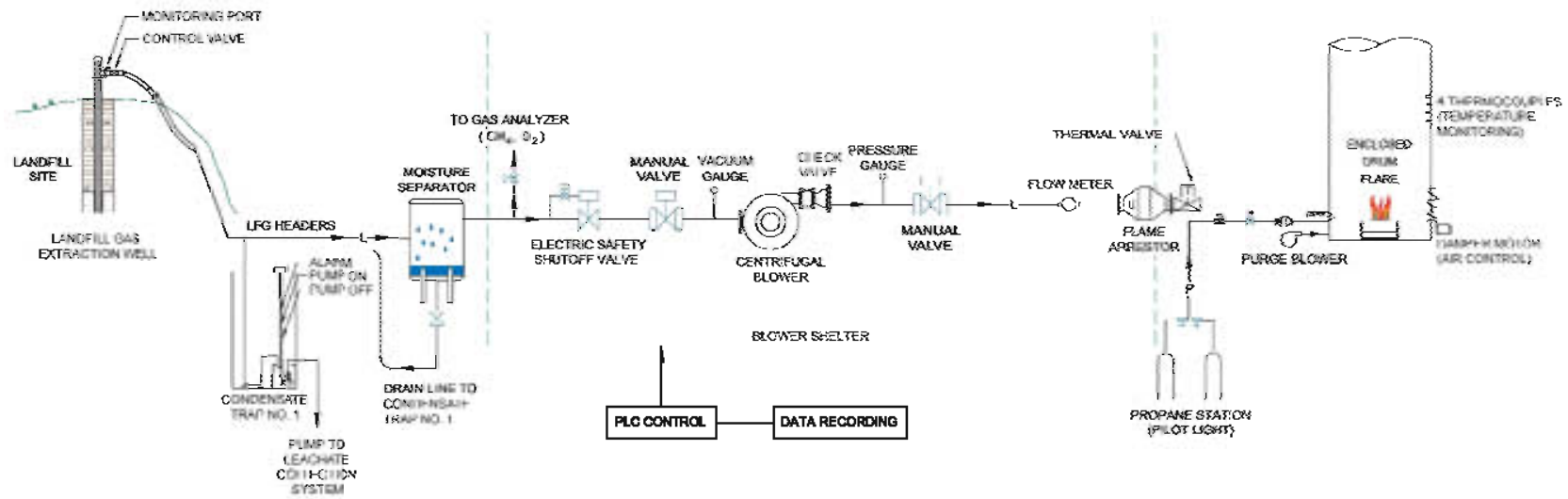


figure 4.1
PROCESS SCHEMATIC
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
ACME LANDFILL
Anytown, Ontario



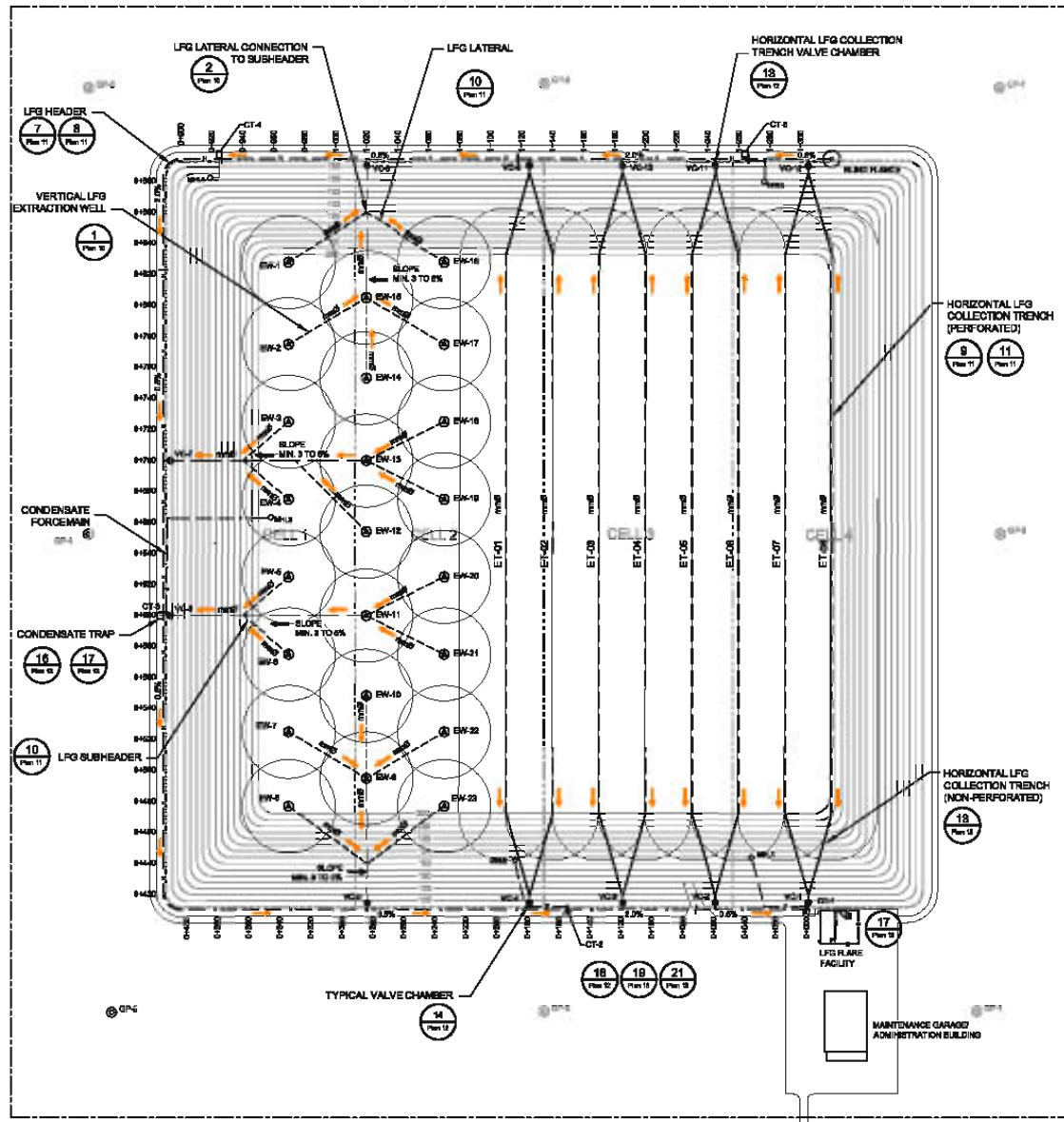
APPENDICES

Appendix A

Landfill Gas Collection And Control System Design Plans

Actual Drawings Provided on D-Size (22" x 34") Sheets

FIGURES



NO.	Revised	Date	By

- LEGEND**
- PROPERTY BOUNDARY
 - EXISTING CONDUIT
 - EXISTING LINE OR DRAINAGE
 - EXISTING ROAD
 - EXISTING GAS WORKING PIPES
 - PROPOSED PIPES
 - PROPOSED CONDENSATE TRAP
 - PROPOSED VALVE CHAMBER
 - PROPOSED LFG GAS EXTRACTION WELL
 - PROPOSED CONDENSATE FOREMAIN
 - PROPOSED HEADER
 - PROPOSED SUBHEADER
 - PROPOSED LATERAL
 - PROPOSED HORIZONTAL LFG COLLECTION TRENCH (PERFORATED)
 - PROPOSED HORIZONTAL LFG COLLECTION TRENCH (NON-PERFORATED)
 - APPROXIMATE LFG FLOW DIRECTION
 - ASSUMED EXISTING FACILITY OR INFRASTRUCTURE

SCALE VERIFICATION	
THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.	

Approved: _____

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DRAWING STATUS		

ACME LANDFILL
Anytown, Ontario

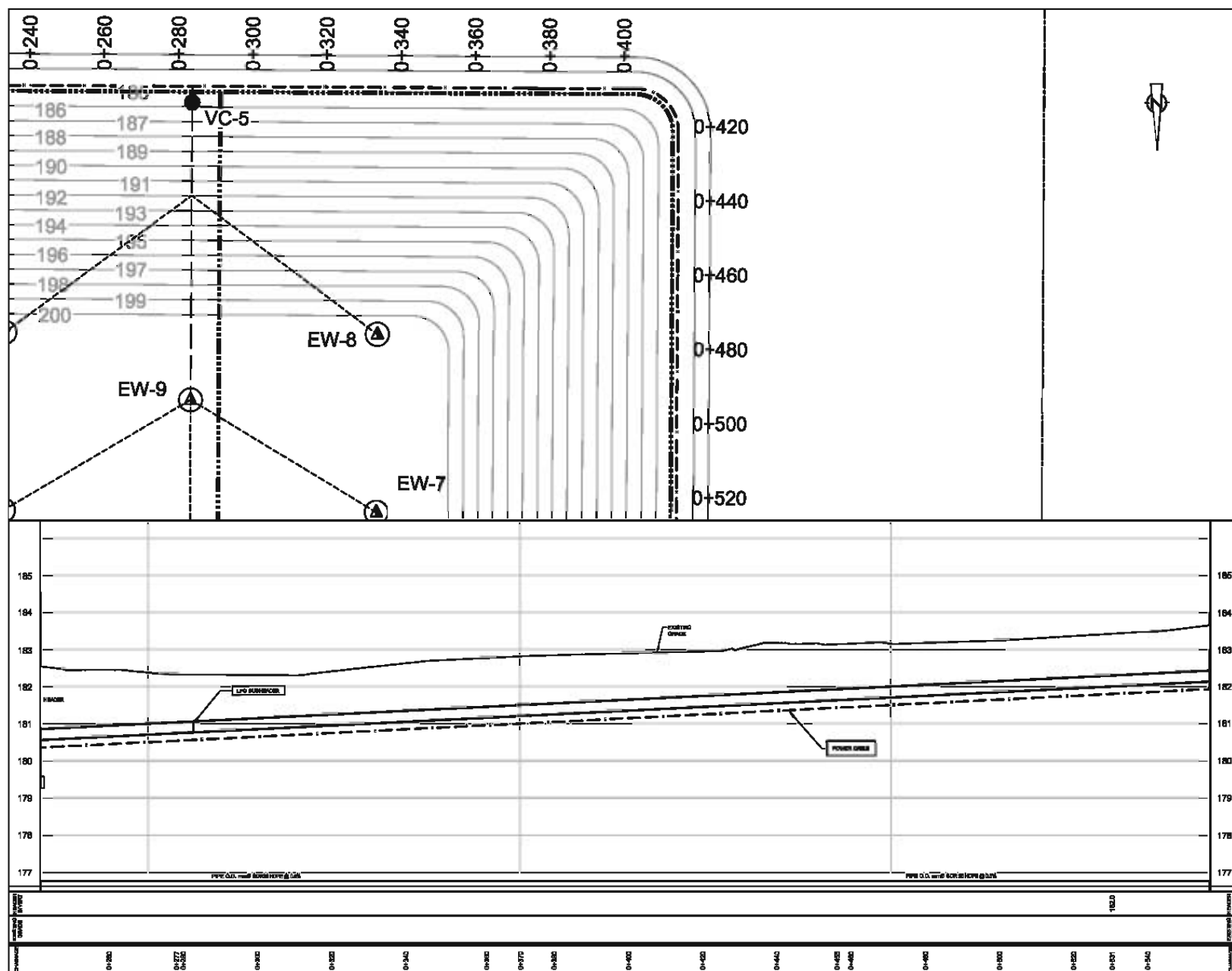
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

PROPOSED LFG COLLECTION WELL FIELD DETAILS

ACME INC.

Project Manager: J. Doeved
Reviewed By: A. Keweenaw
Date: JULY 2020

Scale: 1:500
Project No: S3400-10
Report No: 001
Drawing No: Plan 3

[illegible]

LEGEND

- | | |
|-----------------------------|--------------------------------------|
| IDENTIFYING CONTACT | IDENTIFYING CONTACT |
| IDENTIFYING LIST OF VEHICLE | IDENTIFYING LIST OF VEHICLE |
| IDENTIFYING PRISON | IDENTIFYING PRISON |
| CT-02 | PROPOSED COMBUSTION WAP |
| VC | PROPOSED VALVECHAMBER |
| | PROPOSED ORIENTATION/CONTROL |
| F | PROPOSED COMBUSTION/CONTROL |
| | PROPOSED HINDER |
| | PROPOSED POWER/CHILL |
| | PROPOSED SLAM/CHILL |
| | PROPOSED LOBBY |
| | PROPOSED HIGHLIGHT/ COLLECTION/STAND |

SCALE VERIFICATION

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Source:

PLACE STAMP
AND SIGNATURE
OF LICENSED
PROFESSIONAL
ENGINEER
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RETURN TO ME FOR APPROVAL	JULY 2008	
RETURN FOR CLIENT REVIEW	JUNE 2008	
Order	Date	

ACME LANDFILL
Anytown, Ontario

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

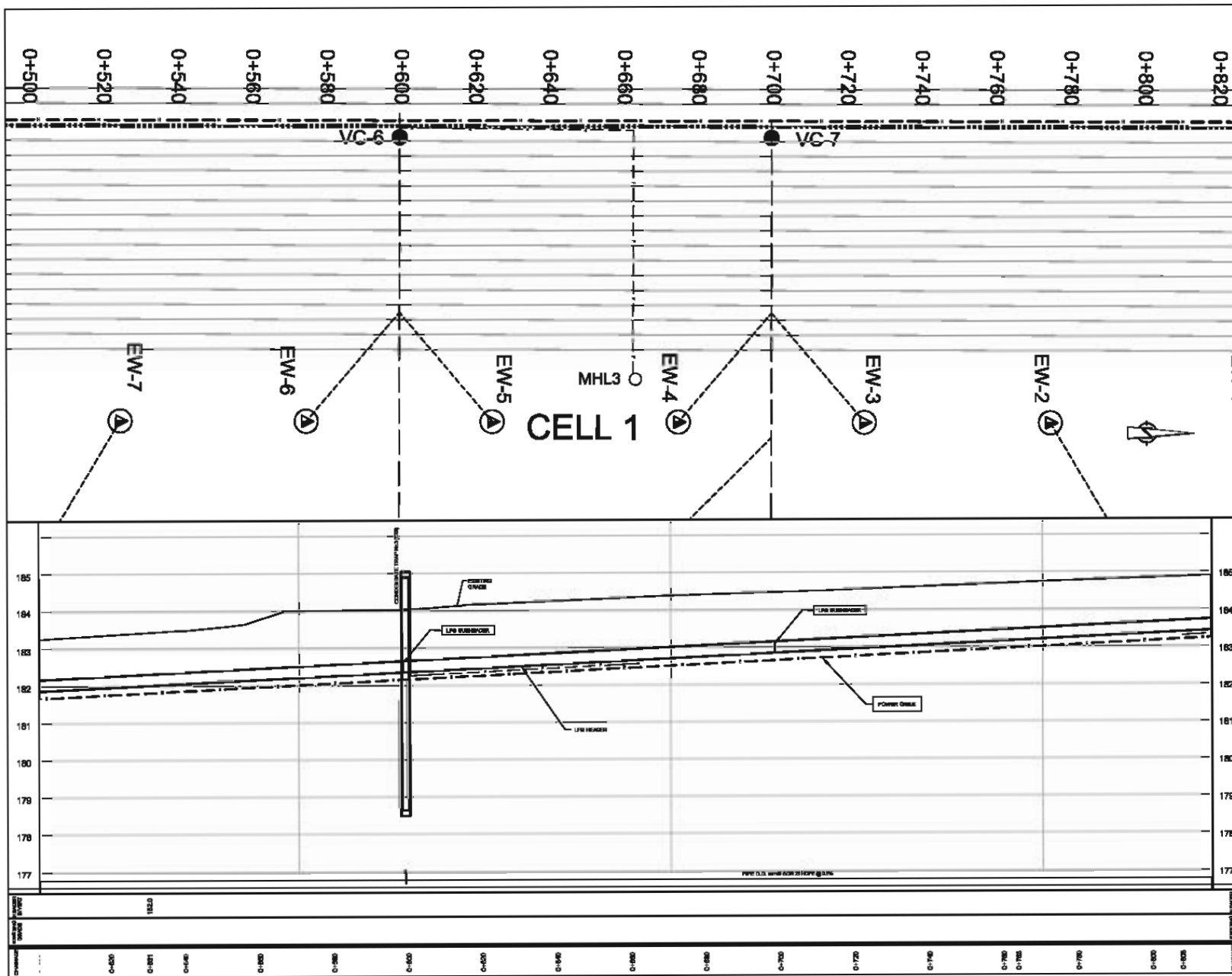
PLAN AND PROFILE
CHAINAGE 0+260 TO 0+520



ACME INC.

Project Manager:	Reviewed By:	Date:
J. Greenfield	A. Swanson	JULY 2000

Owner H&RZ 1, 100 VIKT 1, 100	Project No. 53400-10	Report No. 001	Drawing No. Plan 5
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Station	Date	Scale

LEGEND

- EXISTING GROUND
- EXISTING LIMIT OF YARD
- EXISTING FENCE
- CT-02
- VC
- MHL3
- EW-1
- EW-2
- EW-3
- EW-4
- EW-5
- EW-6
- EW-7
- PROPOSED CONDUIT FOR GROUND
- PROPOSED CONDUIT FOR POWER
- PROPOSED CONDUIT FOR WATER
- PROPOSED CONDUIT FOR GAS
- PROPOSED CONDUIT FOR FUEL
- PROPOSED CONDUIT FOR AIR
- PROPOSED CONDUIT FOR VACUUM
- PROPOSED CONDUIT FOR OTHER

SCALE VERIFICATION
THIS DRAWING IS TO BE USED AS A GUIDE ONLY. ADJUST SCALE ACCORDINGLY.

Approval

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DRAWING STATUS

Revised To	By	Date	Scale

ACME LANDFILL
Anytown, Ontario

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

PLAN AND PROFILE
CHAINAGE 0+520 TO 0+800

ACME INC.

Scale: 1" = 40'

Project Manager: J. Campbell

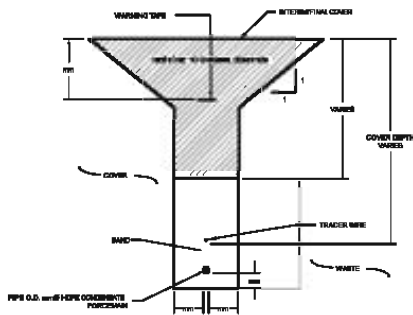
Author: A. Smith

Date: JULY 2008

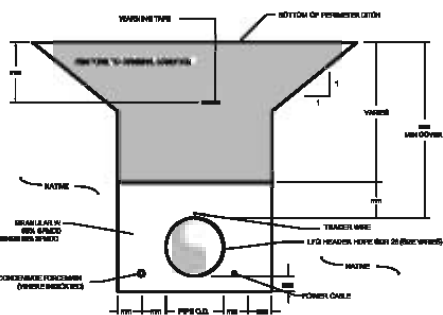
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Drawn: J. Smith

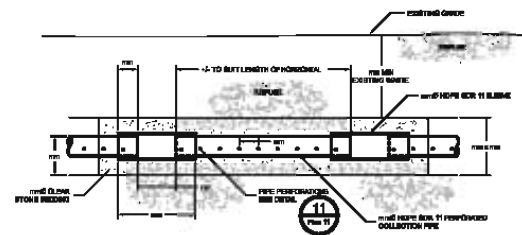
Plan 6



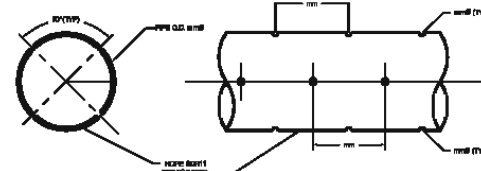
DETAIL 6 CONDENSATE FORCEMAIN TRENCH TO LEACHATE COLLECTION SYSTEM MANHOLE
N.T.S.



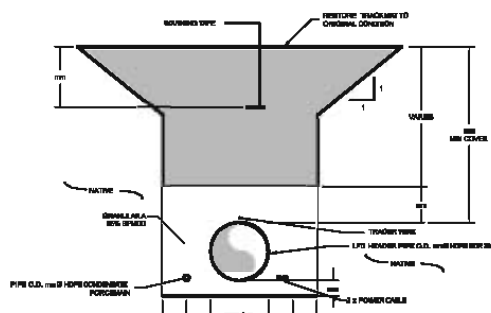
DETAIL 7 TYPICAL LFG HEADER TRENCH
N.T.S.



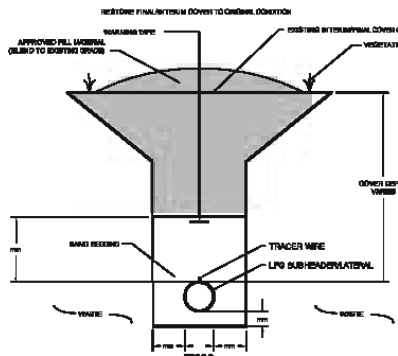
DETAIL 9 TYPICAL HORIZONTAL COLLECTION TRENCH CONNECTION (PERFORATED)
N.T.S.



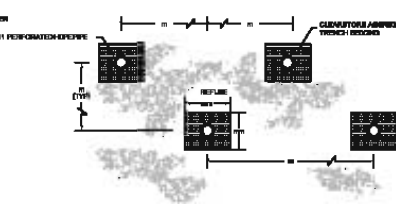
DETAIL 11 HORIZONTAL COLLECTION PIPE PERFORATION DESIGN
N.T.S.



DETAIL 8 LFG HEADER TRENCH FROM 0+000 TO 0+154
N.T.S.



DETAIL 10 TYPICAL SUBHEADER/LATERAL TRENCH
N.T.S.



DETAIL 12 HORIZONTAL COLLECTION TRENCH CROSS-SECTION
N.T.S.

No.	Revision	Date	Issued

NOTE:
1. ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
2. BACKFILL TO BE SAVED IN MATERIAL AREA ONLY.

SCALE VERIFICATION
THIS DRAWING IS TO BE USED AS A GUIDE ONLY.


Approved: _____
PLACE STAMP AND SIGNATURE OF LICENSED PROFESSIONAL ENGINEER HERE

DATE	BY	DATE	BY

ACME LANDFILL
Anytown, Ontario
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
HORIZONTAL LFG COLLECTION TRENCHES
AND LFG HEADER PIPE DETAILS

ACME INC.			
Project Manager	Reviewed By	Date	
J. O'Connell	A. O'Connell	JULY 2008	
Scale	Project No.	Report No.	Drawing No.
AS SHOWN	53400-10	001	Plan 11



		ACME INC.	
Source Reference			
Project Manager J. Crawford	Standard By A. Reviewer	Date JULY 2003	
Route AS BROWN	Project # 63400-10	Report No 001	Drawing # Plan 12

[illegible]

NOTE

SCALE VERIFICATION

THIS BAR MEASURED 10 mm ON ORIGINAL, ADJUST SCALE ACCORDINGLY.

Approved

PLACE STAMP
AND SIGNATURE
OF LICENSED
PROFESSIONAL
ENGINEER
HERE

DRAINING STATUS

ISSUED TO ME: POLARAPPROVAL	JULY 2021	JC
ISSUED FOR CLIENT REVIEW	JUNE 2021	JC
Sharon	Debi	Initial

ACME LANDFILL
Anytown, Ontario

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

CONDENSATE TRAP SCHEDULE AND DETAILS

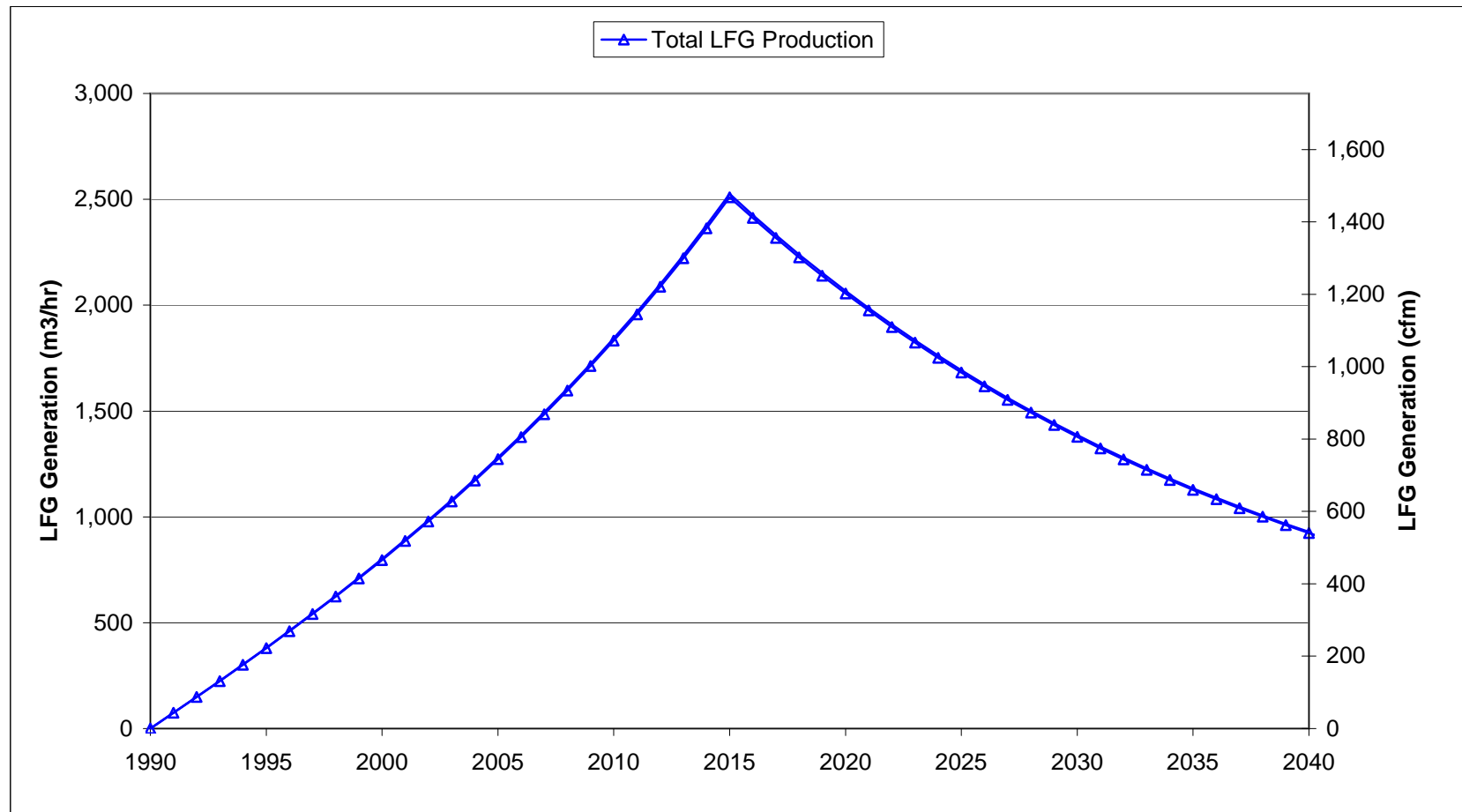


Project Manager: J. O'Brien	Reviewed By: A. Reviewer	Date: JULY 2008
Number: AS 000000	Project ID: 63400-10	Report ID: 001
		Drawing ID: Plan 13

RENTS, ROYALTIES AND OTHER INCOME

Appendix B

Landfill Gas Production Modelling



Notes:

Scholl Canyon Model Parameters: $k=0.04 \text{ year}^{-1}$, $L_0=125 \text{ m}^3/\text{tonne}$.

figure B1
LANDFILL GAS PRODUCTION ESTIMATE
ACME LANDFILL SITE
Anytown, Ontario

Appendix C

Engineering Design Calculations

